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AMERICAN DENTAL ASSOCIATION

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DENTAL CARIES AND THE METABOLISM OF CALCIUM

By HAMILTON B. G. ROBINSON,* D.D.S., M.S., St. Louis, Mo.

DENTAL caries is of importance as a health problem of both children and adults, but control of the disease must be undertaken during childhood. Selective Service figures show that 188,000 young Americans, examined during 1941, did not have twelve strategically placed teeth.[1] Most of these men had lost twenty or more teeth and dental disease was the most important single cause for rejection. (Fig. 1.) Despite statements that many of these young men would have made excellent soldiers and that George Washington was edentulous, there can be no doubt that the masticating mechanisms of the rejected selectees were inefficient and that in many cases their mouths harbored pathogenic bacteria. The blame for this deplorable condition cannot be placed on inadequate nutrition alone, for the men in 1941 each averaged 8 pounds heavier and had four-tenths inch greater chest expansion than those examined for the first World War.[1]

The childhood school health examination records of 411 selectees of Hagerstown, Md., were studied by Ciocci, Klein and Palmer.[2] They compared the 1922-1928 findings with those regarding the same men in 1941 and found that the number of decayed, missing and filled teeth per hundred individuals at the time of childhood examinations was twice as high among rejected selectees as among those accepted by the examining dentists and physicians. They conclude that the need for competent, healthy, physically fit young men in the years ahead must be met by acquiring information on significant early defects, employing accurate measures, recording the information in a useful form and carrying out the necessary corrective work.

A study of the problem of calcium metabolism and dental caries should indicate whether this phase of the nutritional approach justifies the use of high

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calcium and vitamin D diets in an effort to control decay of the teeth.

UTILIZATION OF CALCIUM

The calcium in food is present in organic and inorganic states, but the organic is probably converted to inorganic calcium before absorption occurs. Only from 15 to 35 per cent of ingested calcium is utilized by adults.[3] Of seven individuals on an experimental diet which included 1 pint of milk a day as a source of calcium, six maintained a positive calcium balance, while one drained 32 mg. of calcium from his bones each day. The amount of calcium utilized from milk products, accepted as the outstanding source of this mineral, varied from 18 to 49 per cent of that available to nine experimental subjects.[4] This study indicated that the average adult requires an intake of 4.34 mg. per pound, or about 650 mg. for a person weighing 150 pounds, a considerably higher figure than the long accepted one of 450 mg. a day, as given by Sherman. Of course, only a fraction of the ingested calcium is utilized, the rest being excreted.

The availability of ingested calcium varies from individual to individual. Absorption, which takes place in the upper portion of the small intestine, is greatly increased in an acid environment. Certain forms of calcium, in particular those in milk products, are more readily absorbed than others. Vitamin D is an important factor for proper utilization of calcium, but the mechanism of its action is uncertain. Estimation of the optimal dosage of vitamin D is difficult, but ample dosages are usually given as from 300 to 400 international units for infants, children, adolescents and adults. It has not been possible to determine accurately the requirement during pregnancy, but it is assumed that more vitamin D will be required by the pregnant woman. Lactation results in the greatest drain on the mother, and 800 or more international units of vitamin D may be needed. It seems that between infancy and adulthood, we can place the require-

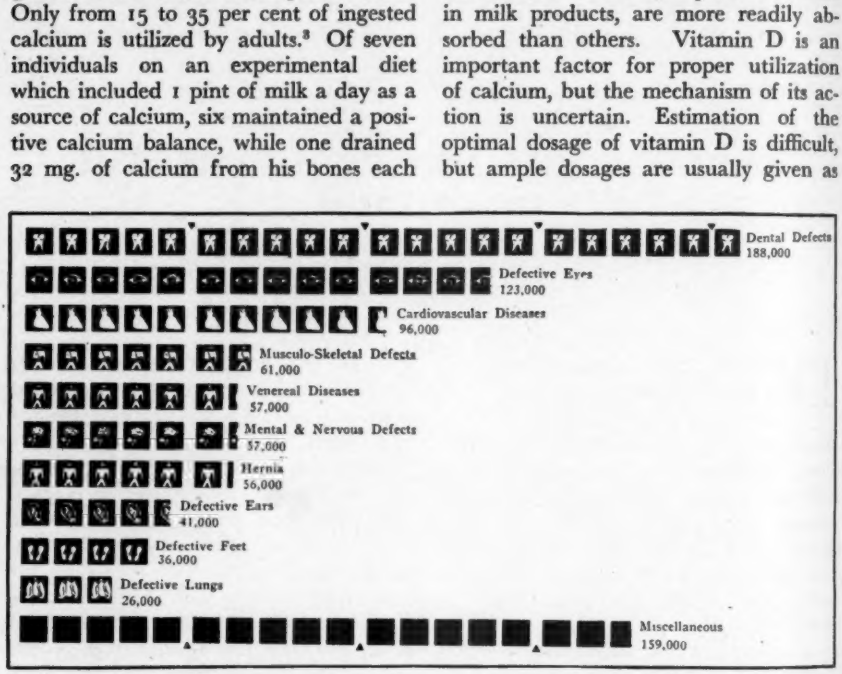

Fig. 1.—Estimated number of selectees rejected in 1941 for physical defects. Each symbol represents 1 per cent of the 900,000 men rejected for military duty. Dental defects were the cause for rejection of 188,000 (approximately one out of five) men considered unfit for service. (Rowntree, McGill and Folk in *J.A.M.A.*, 118:1223, 1942.)

ments for ample retention of calcium and phosphorus at 750 cc. of milk and from 300 to 400 international units of vitamin D per day.[5] (These figures approximate the arbitrary standards adopted by the Food and Nutritional Council of the National Research Council; i.e., 0.8 gm. calcium and up to 400 international units of vitamin D.) Increases in mineral or vitamin intake above the optimal levels do not result in increased utilization or retention of calcium. Vener and Todd[6] presented experimental data in support of this fact by showing that if sufficient vitamin D and calcium are present, additions of vitamin D or calcium will not result in increased mineralization of bone.

The body calcium is distributed throughout the tissues. (Fig. 2.) A minute quantity of calcium is present in each cell, and the blood serum contains from 9 to 11.5 mg. per hundred cubic centimeters, but, in the adult, 99 per cent of the calcium is in the skeleton. The average adult body contains from 1,400 to 2,000 gm. of calcium.[7] Approximately 12 gm. of calcium is found in the permanent dentition and 2.5 gm. in the deciduous teeth. The average new-born infant's body contains about 24 gm. of calcium.

The parathyroid glands help to maintain the serum calcium at a constant level. In parathyroid deficiency diseases, the blood calcium is lowered. In instances of overactivity of the parathyroid glands, the blood calcium level rises, at the expense of the bones.

CALCIUM IN THE BONES

Bone is of connective tissue origin. Calcium in bone is probably in the form of a complex hydroxyapatite, as is that in the hard tissues of the teeth. The exact chemical process that takes place during calcification is not known, but it has been ascertained that normal calcification is, in part, dependent on the presence of phosphatase. About 24 per cent of fully developed bone is calcium. The structure of bone is not constant, but calcification and decalcification proceed normally in adult bone. It is this property of bone that permits movement of teeth in orthodontic therapy. Calcification of bone is dependent on osteoblastic activity, and decalcification on osteoclastic activity. Each of these processes must take place in the presence of cells and blood. Bone

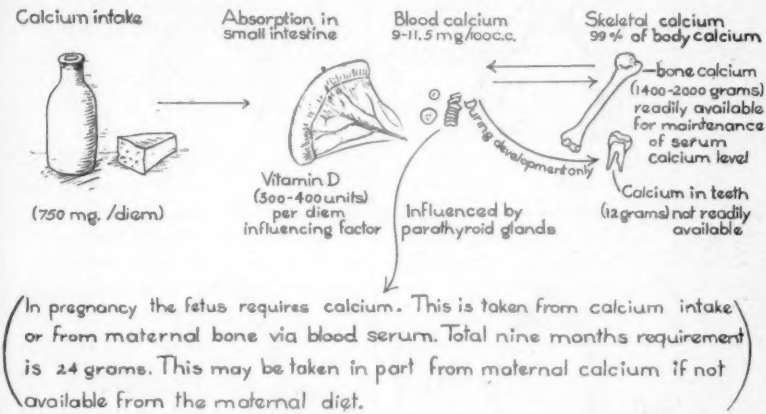
Calcium intake
Absorption in small intestine
Blood calcium 9-11.5 mg/100c.c.
Skeletal calcium 99% of body calcium
bone calcium (1400-2000 grams) readily available for maintenance of serum calcium level
During development only
Calcium in teeth (12 grams) not readily available
(750 mg. /diem)
Vitamin D (300-400 units) per diem influencing factor
Influenced by parathyroid glands
In pregnancy the fetus requires calcium. This is taken from calcium intake or from maternal bone via blood serum. Total nine months requirement is 24 grams. This may be taken in part from maternal calcium if not available from the maternal diet.

Fig. 2.—Diagrammatic representation of utilization and distribution of calcium in the body. The total calcium requirement of the fetus is less than 2 per cent of the total bone calcium of the mother. The maternal reserve is required only in case the calcium intake and absorption are below the daily requirement. The tooth calcium is not available.

trabeculae are surrounded by soft tissue and are ready sources of calcium, which may be needed to maintain blood calcium levels. Foote has compared bone to a bank wherein calcium is deposited for payment on demand.[8]

CALCIUM IN TEETH

The process of calcification in dentin, cementum and bone is quite similar. Enamel may differ in its calcification since its formation differs from that of bone. The basic crystalline structure of bone, dentin, cementum and enamel is that of a complex hydroxyapatite. From 33 to 36 per cent of enamel and 21 to 27 per cent of dentin and about 24 per cent of cementum is calcium. Despite striking similarities between tooth structure and bone, there are differences that are just as important.

Tooth formation begins about the sixth week of intra-uterine life with a proliferation of epithelial buds. Growth and differentiation of this epithelium continues, and the formation of the enamel organ of each tooth is completed. The differentiated enamel organ has inner tall columnar cells (ameloblasts) and outer squamous type epithelium with stratum intermedium and stellate reticulum between. These four layers are arranged in a bell-shaped organ with connective tissue in the hollow of the bell. (Fig. 3, A.) Hampp's micro-incineration studies[9] have shown that the entire odontogenic apparatus is rich in calcium. The connective tissue of the dentinal papilla

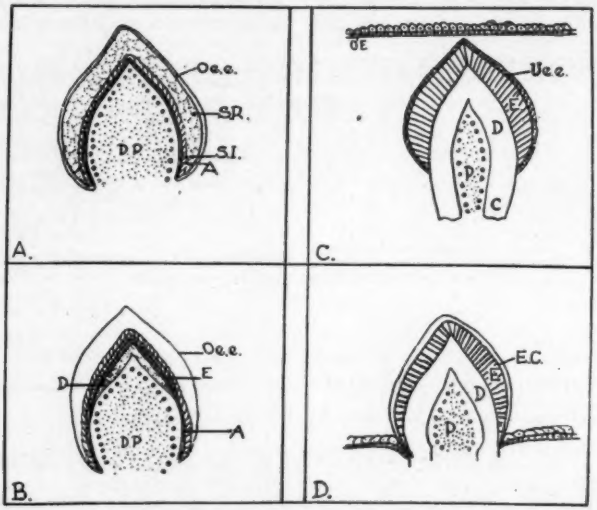

Fig. 3.—Fate of enamel organ. A, tooth forming apparatus before amelogenesis. B, first dentin and enamel deposited, the ameloblasts moving toward outer enamel epithelium (oe.e.). C, enamel formation completed and enamel organ reduced to squamous epithelium (ue.e.). The original ameloblast-odontoblast junction is now the dentino-enamel junction and the original site of the outer enamel epithelium is now the enamel surface. The enamel occupies the entire area formerly occupied by the enamel organ. D, tooth erupted into mouth. The united enamel epithelium is now calcified or keratinized to form the enamel cuticle. No cells remain of the enamel-forming apparatus and dentin-forming tissue is found only on the inner side (pulp). Metabolic changes in enamel and outer dentin are now impossible. A, ameloblastic layer. D, dentin. DP, dental pulp. E, enamel. E.C., enamel cuticle. P, pulp. Oe.e., outer enamel epithelium. o.e., oral epithelium. S.I., stratum intermedium. S. R., stellate reticulum. Ue.e., united enamel epithelium.

is stimulated by intercellular chemical activity to lay down dentin, and following this the ameloblasts begin the apposition of dentin. (Fig. 3, B.) Because the dentin is deposited centripetally, while the enamel is apposed centrifugally (but calcified centripetally), the enamel-forming cells must move outward to allow room for the enamel that it is forming. Finally, when enamel apposition is completed, the inner ameloblast layer has met the outer enamel layer to form the united enamel epithelium. (Fig. 3, C.) The enamel organ is now gone, its former position occupied by the enamel, and only a few layers of cells remain as reminders of its epithelial structure. By the time the tooth has erupted, even these cells will be gone, calcified or keratinized into the enamel cuticle. (Fig. 3, D.) The dentin-forming pulp can still function to deposit new dentin on the pulpal side. A study of Figure 3 will show that, during amelogenesis, the enamel organ is reduced in size and later its few remaining cells keratinize or calcify. It can be seen that the original position of the ameloblasts becomes the amelodentinal junction and that the original position of the outer enamel epithelium is approximately the position of the surface layer of enamel. It is apparent that the enamel is an acellular and avascular product of the epithelium and that its formative organ degenerates so that regeneration of enamel or repair by calcification is impossible. The dentin is avascular and cells are found only on its inner surface. It has tissue fluid, dental lymph, in its tubules and protoplasmic processes of the odontoblasts course through the tubules.

New enamel cannot be formed after the teeth have completed their development; and new dentin can be formed only on the pulpal surface. Enamel is acellular and avascular. Dentin approximates cells and blood on only one surface, and resorption, normally, takes place only in deciduous teeth. It is a distinct error to speak of teeth as storehouses of calcium. While calcium may be deposited in teeth and bones, calcium in teeth is not subject to withdrawal for general systemic use. (Fig. 2.) The passage through which calcium entered the teeth during development has been closed by removal of the tooth crown from within the tissue to its position within the oral cavity. The entire structure must be wrecked from without to obtain the calcium, and then it will be washed away in the saliva. Additional enamel cannot be formed, posteruptively, because the apparatus for enamel formation is gone. (Fig. 3.) There is no provision for rebuilding lost enamel and, at best, only a modified patching of dentin on its inner surface is possible. Increases in calcification of adult dentin are in the form of closure of the tubules (sclerosis) or deposition on the pulpal border. Fish,[10] by feeding adult dogs diets high in vitamin D and calcium for an extended period, was able to raise the blood calcium level and increase the radiopacity of bone, but blocks of dentin removed before and after the experiment showed no differences in calçium content that were beyond the limits of normal variation. Pioneer studies with radioactive isotopes[11] indicate that mineral metabolism in dentin is much below that in bone and that enamel, in turn, has a metabolic rate that is a fraction of the rate in dentin.

Withdrawal of Calcium from Developing Teeth.—Developing teeth are readily affected by disturbances in calcium metabolism. A deficiency of dietary calcium, hypovitaminosis, exanthematous fevers, syphilis, endocrinopathy, fluorosis and many other conditions may leave their indelibile records in the teeth. Schour has demonstrated a "neonatal ring" in the enamel and dentin, an evidence of metabolic disturbance during adjustment to the extra-uterine environment by the newborn.[12] Permanent records like these are found in the teeth alone.

Soft tissues and bones may repair the effects of temporary metabolic disturbances, but the stigmata remain in the teeth, like the rings in a tree, for interpretation. The calcium supply of the parasitic fetus is not a problem, for the maternal food supply or, in cases where this is inadequate, the maternal skeleton, will supply the 24 gm. of calcium present at birth. After birth, the calcium supply is not so readily obtained, for it depends on the dietary calcium and the utilization of that supply. Schour has observed that the prenatally formed enamel and dentin appear denser than those formed postnatally.

During tooth development, calcium deficiencies do not result in removal of calcium from the surface of teeth in any manner similar to the caries process. The results may be lack of development of dentin and enamel (dental hypoplasia). Lund and Armstrong[13] fed diets low in calcium and vitamin D to adult rats and then analyzed the calcium content of bone, incisor teeth (of continuous eruption) and molar teeth (of limited growth). Neither the molar nor the incisor tooth structure showed evidence of decalcification, although bones lost calcium from the interior by osteoporosis. When hypoplastic defects occur, those in the dentin may be partially repaired, but those in the enamel remain. The ingestion of vitamins and calcium, in any quantity, cannot repair hypoplastic teeth once formed and, similarly, nothing can produce these developmental defects in well-formed teeth. These are basic laws of dental physiology.

Withdrawal of Calcium from Teeth of Adults.—There is no basis for the concept that calcium may be withdrawn from the teeth to replace calcium of the blood serum, bones or cells. When the calcium intake falls to a level below the calcium loss, the bones may yield enough to make up the deficiency. The teeth will not give up calcium. As has been pointed out, the process of calcium withdrawal depends on blood and cells, which are not available to the enamel and dentin. That calcium can be withdrawn from teeth only by resorption of the tissue-supported cementum and dentin has been observed in a young man with a deficient thyroid activity who showed areas of lateral root resorption, but a low caries index.[14] Similarly, a cat that had softening of the bones and osteoclastic root resorption just below the epithelial attachment had no dental caries.[15] This type of lesion, rarely observed, is far different from the ordinary cavity produced by dental caries.

Disturbance of the Parathyroid Gland.—Parathyroid gland disturbances during tooth development may cause dental hypoplasia, but, clinically, posteruptive parathyroid disease does not affect tooth calcium, nor does it result in dental caries.[16] In our clinics, a woman was observed with cystlike areas of bone resorption in the mandible, tibias, metacarpals, clavicles and other bones. Biopsy of an area of rarefaction in the jaw showed tissue typical of giant-cell tumors. On the basis of the roentgenographic and histologic evidence, the diagnosis was generalized osteitis fibrosa.[17] This diagnosis was confirmed by the surgeon's finding an adenoma of the parathyroid gland. Despite a severe disturbance of the parathyroid gland that resulted in extensive resorption of bone, the teeth had retained their calcium and did not show increased dental caries. Posteruptive parathyroid gland disease cannot cause hypoplasia of the teeth, and there is no evidence that it causes dental caries. Certainly, the mechanism for such activity has not been demonstrated and the mere observation of caries during a parathyroid disturbance is insignificant, the average healthy person showing 1.4 new cavities per year.[1]

Pregnancy and Dental Calcium.—The saying "A tooth for every child" has had an insidious effect. Dentists, physicians and midwives alike have repeated this erroneous aphorism until many would

give it scientific status. In the first place, this favorite excuse of the misinformed and negligent does not recognize that if calcium withdrawal did occur, it would be approximately equal for each tooth. The old adage infers that any mother may look forward to the birth of thirty-two children before reaching the completely edentulous stage. Of course, this is ridiculous, but so are the other inferences of the aphorism. The fact that calcium in the teeth, unlike that in bone, is not available is overlooked. Withdrawal of calcium from the mineral-hoarding teeth to build the fetal skeleton has not been demonstrated, nor has any possible mechanism been demonstrated for such withdrawal. The idea that calcium withdrawal is a dental problem in pregnancy is associated with the mistaken belief that there is a causal relationship between dental caries and calcium metabolism. Clinical studies by Starobinsky[18] and Ziskin and Hotelling[19] have shown that the caries rate does not increase during pregnancy. These authors used statistical methods and did not rely upon the accumulation of clinical impressions. Careful clinical investigations like these may lead to correction of other erroneous observations. One of the most striking studies is that of Taylor and Day,[20] who found only 1.54 cavities per mouth in twenty-two East Indian women with osteomalacia. This disease is evidence of extreme calcium and vitamin D deficiency, yet eight of the twenty-two women showed no cavities and seven of their rachitic children had only two cavities in their 144 teeth. Huge quantities of calcium can apparently be withdrawn from the bones while the teeth remain unaffected. During pregnancy, women require dental care, just as they do during any other period of life, but pregnancy does not cause dental caries.

Erdheim's calcioprotective law, which states that disturbances of calcium metabolism do not affect the various body tissues equally, is plain. Dental tissues seem especially well protected. Since extreme variations in calcium metabolism occurring after tooth formation do not cause any visible or logically explained calcium withdrawal, how can there be any justification for placing the blame for dental caries on mineral withdrawal in borderline dietary deficiencies?

DIET AND DENTAL CARIES

There have been numerous suggestions that feeding of vitamin D and calcium will prevent dental caries. Efforts based on this concept have not resulted in any appreciable reduction in the national caries rate. As a result, certain persons have suggested that recommending vitamins and minerals as caries preventives is an ideal way to ruin a dental practice. The Council on Dental Therapeutics[21] has approved the statement that all calcium and phosphorus requirements for average needs, including pregnancy and growth, may be supplied by means of a diet containing not only calcium and phosphorus, but also other necessary factors. Further, it is stated by the Council that the ingestion of calcium-phosphorus combinations in addition to diets adequate in these elements does not promote the development of sound teeth in the human fetus. In this paper, the rationale of these statements has been elaborated.

Collins, Jensen and Becks' careful analysis[22] of the caries rates and diets of 366 college students clearly indicates that caries experience is not favorably influenced by the addition of the recommended protective food elements to the dietary. They found that the 122 persons with the highest caries incidence had a diet meeting standardized nutritional requirements as adequately as that of the 122 caries-immune. The well-balanced diet does not offer a dental problem, but is simply a requisite for general health. It is not sensible to suggest that calcium and vitamin D, prescribed over the dentist's signature, will be especially assigned to

the dental tissues. The nutrition distributing mechanism performs no such magical feat. Calcium and vitamin D are essential to the proper development of teeth and for the general physical welfare. Increasing their intake is not insurance against cavity formation and cannot repair carious lesions.

The rôle of carbohydrates in dental caries has been recognized for many years. W. D. Miller's chemoparasitic theory and his experimental work[23] demonstrated the action of acidogenic bacteria on carbohydrates in producing acids which dissolve the inorganic material of enamel and dentin. There are investigators who claim that the streptococcus is the guilty acid former, and others who indict the lactobacillus. Actually, the clinical importance of this question is not great, since the same method can be utilized to control all acidogenic activity. Jay[7] and the Michigan group have developed, and successfully applied, the salivary lactobacillus count as an indicator of caries susceptibility. Ordinary cavity counts show only the results of past or present disease. The lactobacillus count indicates the present resistance to cavity formation. With this clinical laboratory tool, it has been shown that caries rates and carbohydrate intake may be directly related. By the simple expedient of removing the carbohydrates from the diet, the material from which bacteria produce acid is eliminated and cavity formation stopped. It is interesting to analyze the diets used by many investigators who suggest increased calcium and vitamin intake as a caries preventive. Most of these diets are low in carbodrate content as well as high in "protective" factors. The "protective" diet advocates place the emphasis on increased food factors; the carbohydrate group point to the low carbohydrate level. Collins, Jensen and Becks' study,[22] cited previously, included analysis of both "protective" food and carbohydrate values. The 122 persons in the rampant-caries group averaged the equivalent of 7½ more teaspoons of sugar a day than the 122 students in their caries-free group, although the two groups had consumed equally "protective" diets. The fact that some caries-free persons consume great quantities of sugar and starches is not evidence against the theory that carbohydrate degradation is a direct cause of decay, but only emphasizes that tissue and fluid reactions may vary so as to overcome the simpler chemical activities involved. The average American family spent $8.47 at the candy store in 1939. Young children take pennies and nickels to school for candy (often sold by the school itself) and patronize the ice cream peddler. The college students spend hours over "cokes," and the older children, even at the age when they live on retirement pensions, enjoy the "pause that refreshes." All of these pleasurable food habits supply ammunition for the acidogenic bacteria. Possibly the national sugar rationing will prove a dental blessing. It is doubtful if anything short of legislation will result in the necessary sacrifice to the taste. Opposing the dental health carbohydrate reduction is the high-powered advertising of a lucrative industry. If some simple substance could be added to the diet, the task would be easier, but self-denial demands stronger persuasive measures.

SUMMARY AND CONCLUSIONS

Increased calcium and vitamin D intake has not controlled dental caries, and there is no physiologic basis for assuming that it will. Bone and teeth differ in their metabolism of calcium, bone being subject to calcium withdrawal to maintain other calcium needs in the body, and the teeth retaining their calcium even in severe calcium deficiency diseases. Teeth have no vascular or cellular mechanism like that found in the tissues around bone, for osteoclastic removal of calcium.

The average person has from 1,400 to

2,000 gm. of calcium in the body, 12 gm. of this being in the permanent dentition. The body of the average new-born infant contains about 24 gm. of calcium, just 1 to 2 per cent of the amount in the skeleton of the mother. If the calcium intake during pregnancy is adequate for general health, there will not be any calcium loss from the mother's teeth, and, even in extreme calcium deficiency, the loss of tooth calcium is hardly possible. Pregnancy is not a direct cause of caries. Any disturbance in calcium metabolism during tooth development may result in dental hypoplasia, but not in dental caries.

The so-called optimal diet is to be recommended for general health, but not as a caries preventive. The only dietary measure that seems to directly affect the incidence of caries is drastic reduction of the carbohydrate intake.

BIBLIOGRAPHY

1. ROWNTREE, L. G.; MCGILL, K. H., and FOLK, O. H.: Health of Selective Service Registrants. *J.A.M.A.*, 118:1223, April 4, 1942.

2. CIOCCI, A.; KLEIN, HENRY, and PALMER, C. E.: Child Health and Physical Standards. *Pub. Health Rep.*, 56:2365, December 12, 1941.

3. OUTHOUSE, J., *et al.*: Calcium Requirements of Man: Balance Studies on Seven Adults. *J. Nutrition*, 21:565, June 1941.

4. STEGGERDA, F. R., and MITCHELL, H. H.: Further Experiments on Calcium Requirements of Adult Man and Utilization of Calcium in Milk. *J. Nutrition*, 21:577, June 1941.

5. JEANS, P. C., and STEARNS, G.: Human Requirement of Vitamin D; in The Vitamins. Chicago: American Medical Association, 1939.

6. VENAR, Y. A., and TODD, T. W.: Experiments on Maintenance of Mineral Density in Skeleton. *J. Lab. & Clin. Med.*, 22:221-230, December 1936.

7. JAY, PHILIP, in Dental Art and Dental Science. (S. M. Gordon, editor.) Philadelphia: Lea & Febiger, 1938, Chap. 10.

8. SCHOUR, ISAAC: Calcium Metabolism and Teeth. *J.A.M.A.*, 110:870, March 19, 1938.

9. HAMPP, E. G.: Mineral Distribution in Developing Tooth. *Anat. Rec.*, 77:273, July 25, 1940.

10. FISH, E. W.: Effect of Vitamin D on Calcium Content of Dentine. *J. Physiol.*, 84: 272, June 18, 1935.

11. MCCAULEY, H. B.: Significance of Radioactive Isotopes in Dental Research. J.A.D.A., 29:1219, July 1, 1941.

12. SCHOUR, ISAAC: Neonatal Line in Enamel and Dentin of Human Deciduous Teeth and First Permanent Molars. J.A.D.A., 23:1946, October 1936.

13. LUND, A. P., and ARMSTRONG, W. D.: Effect of Low Calcium and Vitamin D Free Diet on Skeleton and Teeth of Adult Rats. *J. D. Res.*, 21:513, December 1942.

14. ROBINSON, H. B. G.: Diagnostic Aids for Difficult Cases. *J. Missouri D. A.*, 19: 97, June 1939.

15. ROBINSON, H. B. G., and BOLING, L. R.: Unpublished data.

16. CAHN, L. R.: Hyperparathyroidism: Effects upon Teeth. New York: Columbia University Press, 1940.

17. ROBINSON, H. B. G., and KOCH, W. E., JR.: Diagnosis of Cysts of Jaw. *J. Missouri D. A.*, 21:187, October 1941.

18. STAROBINSKY, I.: *Deutsche Monatschr. f. Zahnheilk.*, 47:238, 1929.

19. ZISKIN, D. E., and HOTELLING, H.: Effects of Pregnancy, Mouth Acidity, and Age on Dental Caries. *J. D. Res.*, 16:507, December 1937.

20. TAYLOR, G. F., and DAY, C. D. M.: Osteomalacia and Dental Caries. *Brit. M. J.*, 2:221, August 17, 1940.

21. Council on Dental Therapeutics. J.A. D.A., 23:139, January 1936.

22. COLLINS, R. O.; JENSEN, A. L., and BECKS, HERMANN: Studies of Caries-Free Individuals: II. Is Optimal Diet or Reduced Carbohydrate Intake Required to Arrest Dental Caries? J.A.D.A., 29:1169, July 1, 1942.

23. MILLER, W. D.: Micro-Organisms of the Human Mouth. Philadelphia: S. S. White Publishing Co., 1890.

24. KLEIN, HENRY, and PALMER, C. ELSA: Dental Problem of Elementary School Children. *Milbank Mem. Quart.*, 16:267, 1938.

25. MCCOLLUM, E. V.; ORIENT-KEILES, E., and DAY, H. G.: Newer Knowledge of Nutrition. Ed. 5. New York: Macmillan Co., 1939.

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COMPLETE DENTURE SERVICE WITH BALANCED FUNCTIONAL OCCLUSION

USING THE PATIENT AS HIS OWN ARTICULATOR

By THE CENTRAL NEBRASKA STUDY CLUB*

IT is a recognized fact that a scientific denture service is a health-maintaining benefit to every edentulous patient. Balanced functional occlusion is the outstanding condition to be achieved if success in its full meaning is to be attained from the standpoint of both the patient and the operator.

In presenting a precision technic in the construction of dentures, too few of us have the will to master all of the required steps, following them through in their entirety to a definite conclusion, but seek instead the time-saving shortcuts which always prove disastrous. The precision technic here presented must be followed out in its entirety in order to be successful.

Each individual generates his own occlusal functional path. The teeth are so arranged as to bring about perfect coordination between the muscular development, the temporomandibular joint and the travel path of the mandible. We have the muscular development and the travel path of the temporomandibular joint and, on recording them, we have an individual articulator.

In presenting this paper, we shall assume that the edentulous ridges have been properly prepared.

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IMPRESSION TECHNIC

It is an interesting fact that the normal relations of the parts inside the mouth proper cannot be observed by the examiner. As soon as the mouth is opened, the parts are in a state of tension; muscles have come into play, and everything within the mouth assumes relationships far different from those of the structures at rest or during functional excursions. These abnormal relations are too often obtained in taking impressions and the dentures are constructed over casts that do not portray the correct relationship of rest or function. The technic presented here follows the reproduction in stone of the parts involved, at rest and during normal function.

TECHNIC FOR MAKING INDIVIDUAL TRAY

A stock tray with enough extension to cover all the essential areas of the parts involved is selected. A preliminary compound impression is taken in the usual manner and after all mechanical locks and undercuts have been removed, this is poured in stone. On this preliminary model, a tray is formed, an adaptable metal obtainable at any dental supply dealer being used. (Fig. 1.) The metal is swaged to the model to fit approximately. The parts are soldered together with ordinary soft solder. Extra rigidity can be brought to any part of the tray by adding solder to that part. Caution: The tray is placed in water containing soda to neutralize the acid solder and then inserted in the mouth, being carefully fitted until it rests lightly in place

without impingement upon the movable tissues and is comfortable to the patient.

The final impression can be taken with impression plaster or any of the commercial plaster base materials. The requirements are easy flow, a quick set and a clean fracture. Spatulation is continued until the material starts to set, yet is still moldable. The stage of setting of the material is very essential when the material is placed in the mouth. The tray is seated with the material in place, with care not to exert any undue pressure. In most cases, the tray may be released immediately. The patient is engaged in ordinary conversation, using words and phrases that will bring into play the tongue, lips and cheeks. The face tissues are gently manipulated along the buccal periphery, with avoidance of all excessive manipulation of the parts involved. The impression is allowed to set for from five to seven minutes, the patient being at ease during this period. Conversation may be carried on and the patient be allowed to expectorate, and yet the parts are not subjected to the usual excessive manipulation. The impression is removed carefully, and if all the periphery of the tray is covered with the impression material (Fig. 2, B), we have an impression with the parts at rest, without pressure or overdistention of the tissues, and made with the normal activities of the tongue, lips and cheeks. The area of the extension of the denture is automatically outlined, forming a full functional periphery which produces the atmospheric seal, molded in the mouth by the tissues. We must be very careful to reproduce this outline in the stone model (Fig. 2, C), since the finished denture should carry the same outline as made in the impression.

Balanced functional occlusion in complete dentures bears a direct relation to each individual temporomandibular articulation. It is the most important factor in comfortable and serviceable dentures. If the dentures are properly balanced in coordination with all the mandibular movements, the health and function of the point and ridge will be preserved as well. Therefore, after due consideration of good impressions and the individual esthetic requirements, tissue resiliency and muscles of function, it is still necessary to establish an occlusion in harmony with the movements of the temporomandibular joint before our efforts will meet with great success. With this cardinal principle in mind, we proceed with a description of a method of obtaining balanced functional occlu-

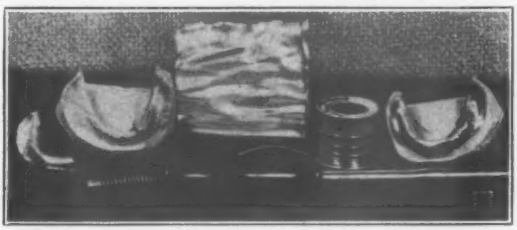

Fig. 1.—Adaptable tray metal for making individual tray.

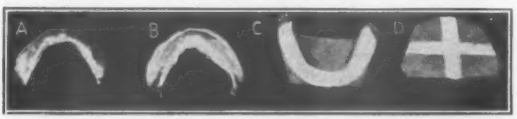

Fig. 2.—A, finished individual tray. B, finished impression. C, stone model. D, scored cast.

sion. This method, originated by F. S. Meyers, of Minneapolis, has proved a great success in our hands.

1. Accurate stone models are made from good impressions.

2. Two sets of well-fitted baseplates are made and are reinforced with flattened wire. (Fig. 3.)

3. On one set of baseplates, the bite-rims are built up with hard baseplate wax. (Fig. 3.) The approximate vertical dimension and occlusal plane are established on these bite-rims. The occlusal plane should be parallel with a line drawn from the ala of the nose to the tragus. (Fig. 4.) The approximate curve of Spee can be secured by observing the various mandibular movements of the patient. Wax is added to one rim and removed from the other until a comparatively accurate curve is made. When the bite-rims maintain fair contact in all the mandibular movements, the approximate occlusal plane will have been established. The high and low lip lines and the median line are marked. The anterior teeth are set up according to esthetics. The posterior teeth are selected after the set-up of the anterior teeth has been approved for appearance, because the greater the overbite, the greater the cusp height should be.

4. The bite fork is attached to the upper baseplate. Approximate centric relation is established in the patient's mouth and the bite-rims are stapled together. By means of the facebow, transfer is made to a plain line articulator. (Fig. 5.) The articulator must be rigid and have two vertical stop openings.

5. The casts are scored in the form of a cross and vaselin is applied to the bases prior to mounting on the articulator. (Fig. 2, D.)

Fig. 3.—Two sets of rigid baseplates reinforced with flattened wire (one set with hard wax rims).

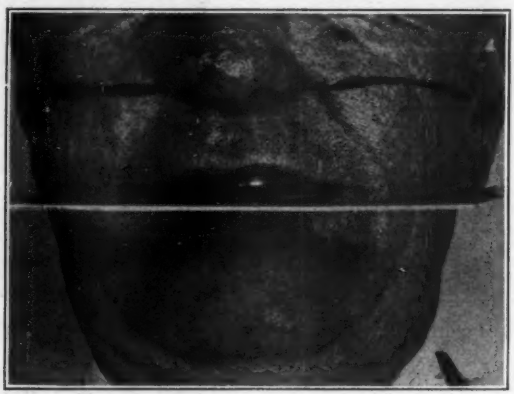

Fig. 4.—Lower part of face showing line drawn from ala of nose to tragus, with parallel occlusal plane on wax bite-rims indicated.

6. On the second set of baseplates, compound bite-rims are built up opposite the wax rims on the articulator. While the compound is still soft, 2 mm. of wet blotting paper is inserted between the compound and the opposite wax rim, and the articulator is closed. We thus obtain upper and lower compound rims each 2 mm. shorter than the wax rims, but with the same occlusal curve. By means of a pair of dividers, a point is indicated in the median line on the labial surface of both the upper and the lower compound bite-rims. The divider is locked and laid aside for future reference.

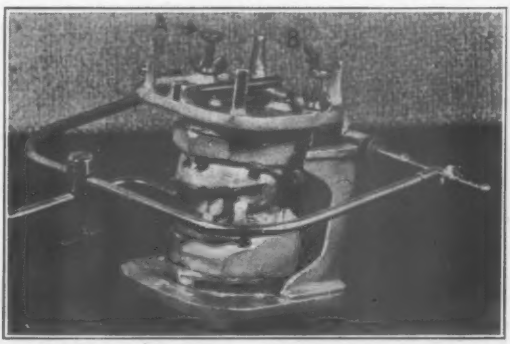

Fig. 5.—Casts mounted on plain line articulator by means of facebow. A, stop locked at correct vertical dimension. B, second pin stop.

Fig. 6.—A, counter wax on compound rim. B, 0.002 gage tinfoil covering wax.

7. Now, 3 mm. of red counter wax is added and sealed securely to the occlusal surface on each rim (Fig. 6, A) and covered with a smooth layer of 0.002 gage tinfoil. (Fig. 6, B.) The waxed bite-rims are dipped in cold water to harden the compound. The surfaces of the tinfoiled rims are covered with vaselin and the waxed compound rims are placed in the patient's mouth. The rims must be held securely in place in the mouth with denture powder. Five minutes is allowed for the wax to reach mouth temperature.

8. The vertical dimension is now open owing to the excess of soft red wax. The patient is instructed to close and slide the jaws in the various positions of the mandible with ordinary pressure. The sliding movements must be continued until correct vertical dimension is reached. Vertical dimension is determined by checking with the locked dividers mentioned previously. We now have the patient's true functional occlusal path generated in soft wax at the proper vertical dimension. It must be kept in mind that these paths are as different in each individual as are the facial features.

9. True rest centric position on the

functional occlusal wax paths is established as follows. Some of the wax is trimmed from the labial surface of the lower path so that the occlusal surface of the upper is partially in view when centric position is approached. By means of a warm explorer, the median line is marked on the labial surface of the lower path. The patient's head is tipped back and he is asked to close the jaws in the most retruded position. A slight indentation is made with the explorer in the upper wax rim just above where the median line is marked on the lower and the head is tipped in an upright and comfortable position. If the jaws come to rest at the same point and the patient is comfortable, this in all probability is for him the true rest centric position. In some cases, the rest point (Fig. 7, A) with the head upright will be slightly anterior to the most retruded position. (Fig. 7, B.) This slightly anterior point, then, is the rest centric position. It is an established fact that the patient, after generating the wax paths, and if sitting in a comfortable position, will usually bring the jaws to the working or rest centric position voluntarily, because the muscles of mastication will have reached the fatigue point.

10. The wax paths are stapled together in the patient's mouth at the rest centric position established and removed from the mouth. It will now be necessary to remove the lower cast from the articulator and remount it. This new mounting will vary slightly from the original because centric position has been corrected. One of the stops is set and locked on the articulator with this new mount-

Fig. 7.—A, rest centric position. B, retruded centric position. C, true functional occlusal path reproduced in stone.

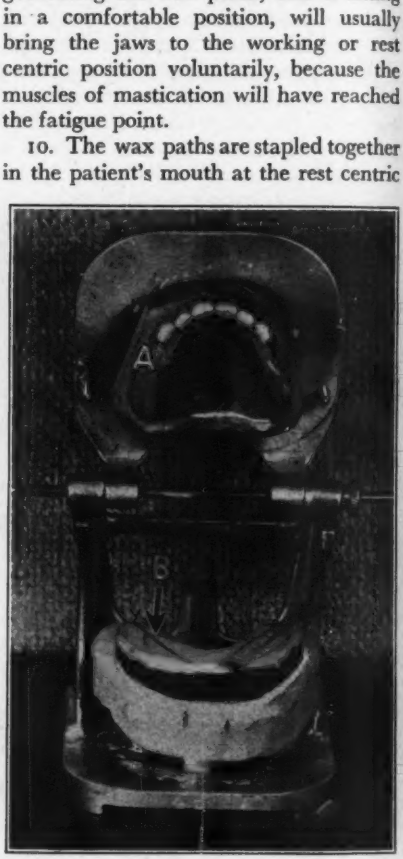

Fig. 8.—A, baseplate with six anterior teeth set to show appearance. B, line on stone path indicating crest of lower ridge.

ing and this vertical dimension is maintained throughout. (Fig. 5, A.)

11. After the plaster has set on the remounted lower cast, the biteblocks are removed, and also the wax and tinfoil are removed from the lower compound rim. The remaining rim is boxed in with molding clay. Vaselin is applied to the upper tinfoiled wax rim and the upper arm of the articulator closed down, to correct vertical dimension, into a mixture of stone added to the lower boxed-in rim. The individual true functional

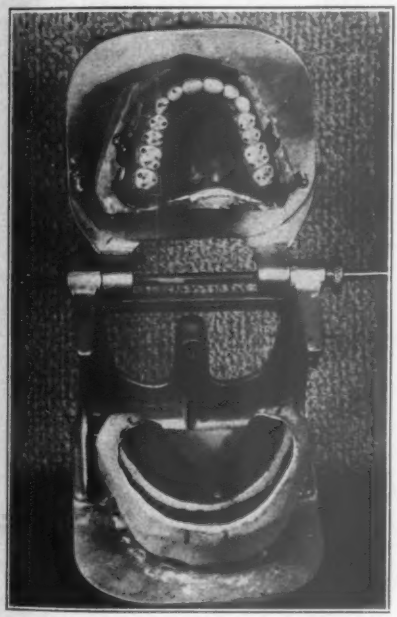

Fig. 9.—Upper posterior teeth set to stone path so that all major cusps touch.

occlusal path has now been reproduced in stone on the lower (Fig. 7, C), and it is indestructible when the upper posterior teeth are being set to this path. The upper compound with the soft wax rim is removed from the model and replaced with the baseplate that had previously been used for attaching the six anterior teeth according to esthetics. (Fig. 8, A.) If any of the six anterior teeth touch the stone path before correct vertical position is reached, the interfering stone should be cut away, the operator making certain that none of the stone is removed where the posterior teeth will later be contacted. Lines are drawn on the lower stone path corresponding to the crest of the lower ridge. (Fig. 8, B.) These lines serve as a guide in setting the upper posterior teeth.

12. Now the articulator is opened 1 mm. by means of the second pin stop. (Fig. 5, B.) The upper posterior teeth are set to the stone path so that all the major cusps touch. (Fig. 9.) The posterior teeth are kept as far lingually as the appearance and the tongue room will permit. If the occlusal surfaces of the lower molars are slightly lingually from the crest of the ridge, the ridge will act as a fulcrum during mastication and will proportionately increase masticating comfort and efficiency. The stone path is painted with prussian blue (as in Figure 9) and the second pin stop released. By slight manipulation and spot grinding of the upper posterior teeth, the instrument is closed to correct vertical dimension with all the major cusps of the upper posterior teeth now in contact with the lower stone path. At this point, the pin stop is again opened 1 mm. and the lower teeth are set to the upper teeth. If it is necessary to move any upper posterior teeth for proper articulation with the lower, the upper teeth must again be checked in regard to the lower stone path.

13. The upper denture is now processed in the following manner: The upper cast is removed from the articulator. The base of the scored cast is foiled prior to the flasking and the upper is processed in the material of choice. After it has been processed, the case is removed from the flask without removal from the cast. The foil is removed from the base of the cast and the cast is reattached to the articulator in exactly

the same position as it was before the upper cast was processed. The lower stone path is again painted with prussian blue. The articulator is closed and, by grinding of the teeth, any discrepancy caused in the processing is corrected against the stone path.

14. The stone path is now removed from the compound on the lower cast and about 3 mm. of black compound is added. The upper teeth are lubricated, and the upper processed case is closed into this soft compound in correct vertical position. Care must be taken that an accurate impression of all the sulci and grooves is registered in the compound. After the compound has cooled, and sulci analysis. The patient is asked to slide the teeth to the right lateral position. The point where the buccal cusps of the upper teeth contact the compound ridge is examined carefully. If it is found that the compound does not contact the tips of the buccal cusps of the upper teeth in all places, the corresponding sulcus and groove are deepened, a new bead of compound is added and the impression of the deepened sulcus and groove is corrected. Then another examination is made in the same position. When the compound ridge contacts the tips of the buccal cusps of the upper teeth in the right lateral movement, the left lateral movement is then

Fig. 10.—Impression of sulci and grooves (black ridge). A, flat table. (The black compound on white is used for photographic purposes.)

the upper denture is removed from the instrument, removed from the cast, finished and polished.

15. All the compound is trimmed away from the compound impression just taken, except the impression of the sulci and grooves. (Fig. 10.) A flat table (Fig. 10, A) is left on each side of the resultant ridge, to later carry a soft wax. This compound ridge is inserted in the mouth, and the patient is asked to close in centric position against the upper finished denture.

16. We are now ready for the cusp balanced in the same manner. Now the patient is asked to slide the teeth in protrusion, and any interfering compound in the anterior region is cut away. He is then instructed to slide the teeth in the most retruded position, and any interfering compound is removed. Now the patient is asked to slide the teeth in all the mandibular movements a few times, to polish the compound ridge, and any interfering compound that was missed in the analysis will be quickly worn away. The cusp and sulci analysis is complete when the patient can slide

the teeth to either lateral position and all the cusps touch the compound ridge on the working side as well as on the balancing side. (Fig. 11.)

17. The cuspal tracing wax is flowed over the compound table (Fig. 10, A) to a height a little above the compound ridge. Chilling is done in cold water to avoid distortion of the compound ridge, which is placed in the mouth and left five minutes to allow the wax to assume mouth temperature. Then the patient is asked to close the jaws in centric position and maintain this relation until the compound ridge shows through the red wax will tear if the patient slides the jaws both ways. If the wax should tear or pull away from the compound table, it is dried carefully, a little new wax is added and the cuspal paths are accentuated until correct.

18. The wax containing the cuspal path is removed from the mouth, dried thoroughly and placed on the lower cast on the instrument (Fig. 12, A), carefully boxed, poured in stone and attached to the upper arm of the instrument in correct vertical position. (Fig. 12, B.) After the stone has set, the excess is trimmed away, all wax that may

Fig. 11.—Correcting compound ridge to contact tips of buccal cusps of upper teeth.

wax. Now the patient is asked to slide the teeth in protrusion from centric position, maintaining enough pressure to register the incisal and cuspal paths in the soft wax. From centric position, the patient is asked to slide the teeth to retrusive position a few times, then from the centric to the lateral positions until a smooth cuspal path of the upper teeth is generated in the soft wax. At the completion of each lateral and protrusive movement, the patient is instructed to open the jaws and return to centric position without touching the wax. The be clinging to the stone is removed and the path is painted with prussian blue. The lower teeth are placed on the cast and the instrument is closed to near centric position by grinding or moving of the interfering teeth.

19. The lower denture is now waxed up and processed. The processed lower case is returned to the articulator in the same manner as the upper and recorrected to the stone cuspal path to eliminate any dimensional change that occurred during processing and to reach the correct vertical dimension.

20. We have now an upper and lower denture that is in absolute functional balance in the mouth.

21. If the appearance does not demand cusp teeth, balanced functional occlusion can be obtained with cuspless posterior teeth by setting and grinding the posterior teeth to the flat stone paths. Two lower flat stone paths must be poured, the same upper flat wax path being used for both. The first lower flat stone path is poured and attached directly to the lower arm of the articulator. When the stone has set, it is separated carefully and the second lower stone path is poured on a baseplate mounted on the lower cast. Now one upper stone path is poured and attached directly to the upper arm of the articulator. By having the second lower stone path poured on a baseplate, it is easy to mark on it lines indicating the crest of the lower ridge to aid in the setting of the upper posterior teeth. The upper and lower cases are processed at the same time and returned one at a time to the articulator for checking and grinding according to the opposite stone path. As in the technic described for cusp teeth, the dentures are left on the casts after processing so that they may be returned to the articulator exactly as they were before removal for processing. Each denture, after it has been balanced to the opposing stone path, is removed from the cast, finished and polished.

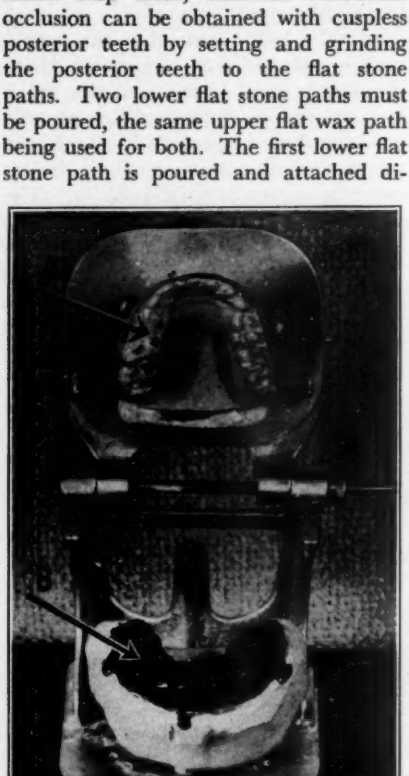

Fig. 12.—A, cuspal wax path on lower cast. B, stone cuspal path.

SUMMARY

The balanced functional occlusion of an artificial denture with an opposing natural denture can be assured as follows:

1. Secure a good impression and make a stone model of the arch to be restored.

2. Make two well-fitted baseplates, reinforced with flattened wire.

3. Make a built-up bite-rim of black compound to establish vertical dimension and centric position, and to secure an impression of the occlusal surfaces of the natural teeth.

4. Trim the compound, leaving only the impression of the pits, sulci and marginal ridges, with a flat table buccally and lingually from the resultant ridge. The cusp and sulci analysis is accomplished as in the preceding technic, the grinding being done on the natural teeth. Should excessive grinding be necessary for absolute balance, the patient is instructed to make lateral and protrusive movements until the compound is worn away by the teeth to a balance.

5. Flow cuspal tracing wax over the compound table and generate the cuspal wax path as described in the preceding technic.

6. Attach the bite-fork to the compound rim. Score and apply vaselin to the base of the cast. Mount the cast on

the articulator by means of a facebow transfer.

7. Pour the wax cuspal path in stone and attach to the opposite arm of the articulator with one pin stop set at the vertical dimension.

8. Set the anterior teeth according to esthetics. Open the second pin stop one half turn and set up the posterior teeth and adjust to the stone cuspal path.

9. Return the processed case to the articulator, on the cast, reattach as previously described and correct to the stone cuspal path at correct vertical dimension. Remove, finish and polish the denture. This technic will assure an excellent, well-balanced denture.

CONCLUSION

In the technic just presented, each patient generated the occlusal functional path. This technic correctly registers the movements of the mandible under normal masticating pressure. Each patient has therefore developed his individual articulator throughout the procedure. Once understood, this technic can easily be executed. It is simple, logical and correct. The end-result is a comfortable denture in absolute balanced functional occlusion, which gives satisfaction to the patient.

TREATMENT WITH THE MODIFIED EDGEWISE ARCH MECHANISM

By SAMUEL H. STEIN, A.B., D.D.S., New York, N. Y.

THE modified edgewise arch technic was first adopted at the Hospital for Joint Diseases in 1937. For five years, it has been used successfully in hundreds of cases both at the hospital and in private practice. Extensive case analyses[1, 2, 3] have shown that its use has reduced the time of treatment to about half without injury to the soft tissues or supporting bone and without causing any appreciable root resorption.

The technic was developed by Alexander Sved,[1] who believed that the edgewise mechanism of Angle,[4] effective though it was, had certain deficiencies: (1) the rigidity of the heavy arch wire as it was locked into the horizontal slot of the bracket on the individual teeth; (2) the excessive pressure exerted on the teeth by the heavy rectangular arch wire, and (3) the great skill necessary for the manipulation of the arch wire to obtain the torque action on the teeth requiring bodily movement.

The chief features of the modified edgewise technic are: (1) modification of the bracket; (2) its application for individualized arch predetermination,[3] and (3) the use of small gage resilient steel arch wires that require a minimum of manipulation.

The channel in the modified bracket (Fig. 1) is formed by two opposite wedges instead of the horizontal slot found in the Angle bracket. Since the arch wire fits between the points of the opposing wedges, it has freedom of movement in the slot, so that the relationship between the axis of the tooth and the wire can be changed. All necessary tooth movements are easily accomplished by placing the necessary eyelets on the band before cementation. (Fig. 2.)

Two cases here presented show the

Fig. 1.—Modified bracket.

Fig. 4.—Lower vulcanite biteplate in position. The height of the plate is sufficient to permit labial movement of the upper anterior teeth.

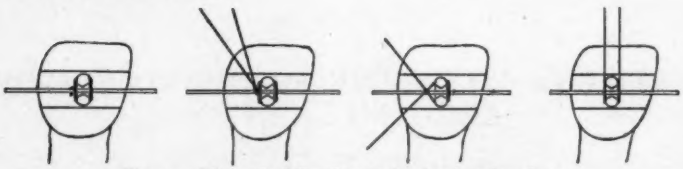

Fig. 2.—Method of ligating arch wire into bracket.

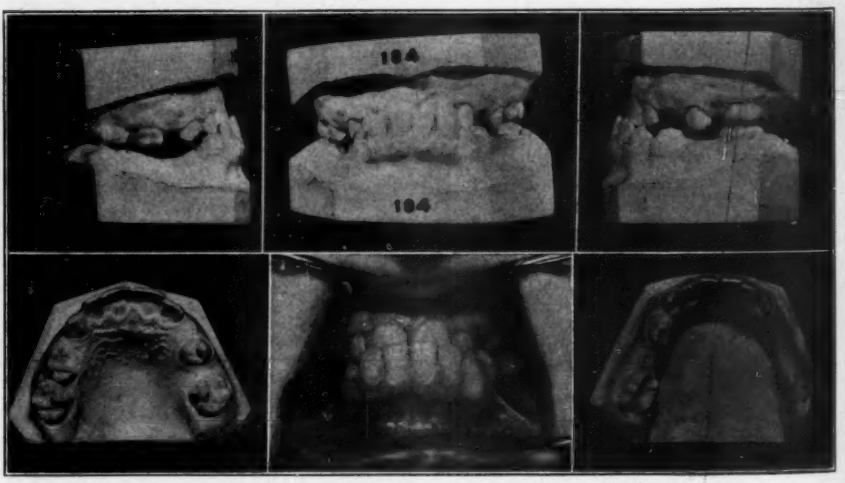

Fig. 3.—Functional Class III malocclusion before treatment, in child aged 11.

application of the modified edgewise technic. Figure 3 shows the casts of a patient, aged 11, with a functional Class III malocclusion. The lower right first permanent molar, as well as the deciduous molars on that side, had been lost prematurely. Had the case not presented speech, esthetic and functional defects,

treatment would have been postponed until the permanent dentition was complete. This case, however, called for immediate intervention. With the aid of a lower vulcanite biteplate (Fig. 4) and a conventional heavy labial arch wire on the upper teeth, the six incisors were brought over the lower anterior teeth. (Fig. 5.) Four months was required for this phase of treatment. Two years was allowed until the exchange from the deciduous to the permanent dentition had proceeded to a favorable point. An additional six months was allowed for surgical exposure of the right first bicuspid and its favorable eruption. During this two and one-half year period, a lower lingual bar appliance was worn by the patient to establish function on the right side and to prevent the upper right posterior teeth from extruding from the sockets.

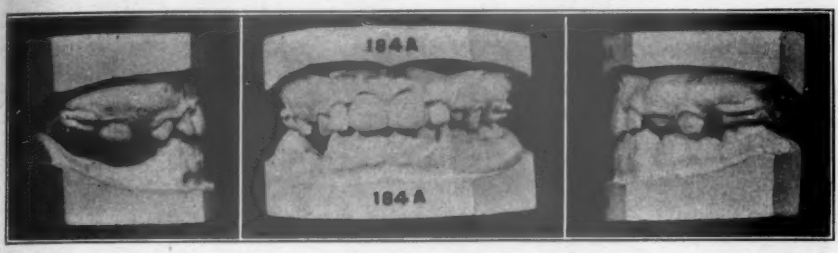

Fig. 5.—Appearance after four months of treatment. The upper anterior teeth have been brought over the lower incisors. The biteplate was discontinued after this point.

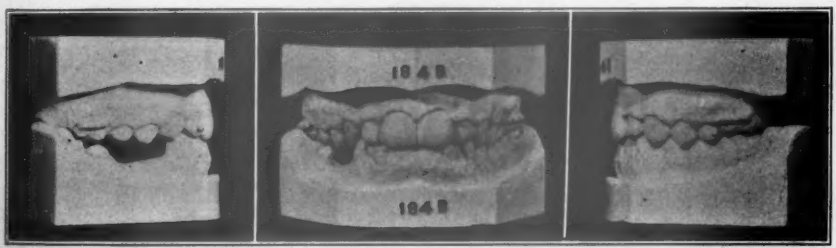

Fig. 6.—Right, eruption of lower second bicuspid and second molar. All the lower teeth were banded shortly after this stage, when the first bicuspid was exposed surgically.

Fig. 7.—Upward vertical bends in arch wire elevating lower bicuspids.

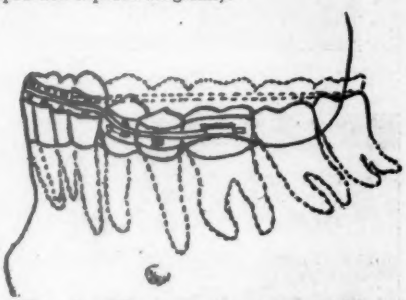

Fig. 8.—Diagrammatic representation of increase in vertical height following adjustment shown in Figure 7.

When the lower right second molar and second bicuspid teeth (Fig. 6) had erupted, the lower teeth were banded and a light resilient arch wire, 0.014

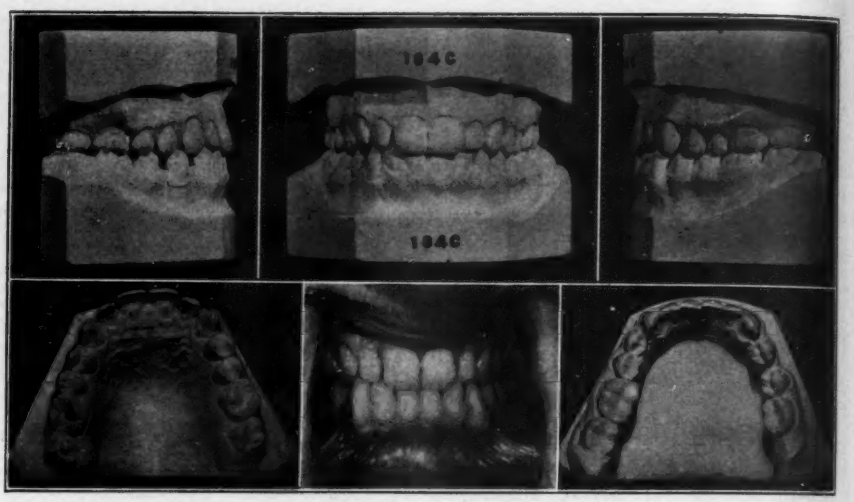

Fig. 9.—Models and intra-oral view of finished case.

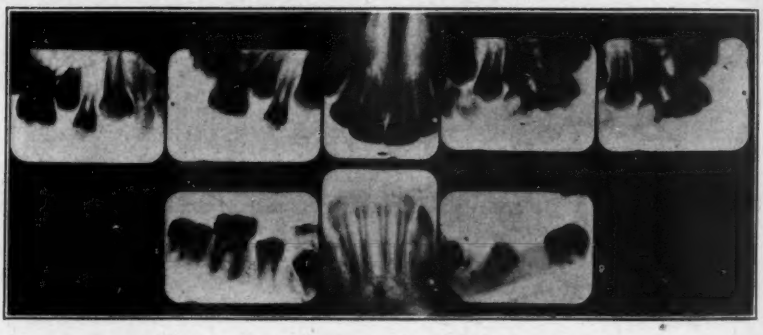

Fig. 10.—Roentgenograms of teeth before treatment.

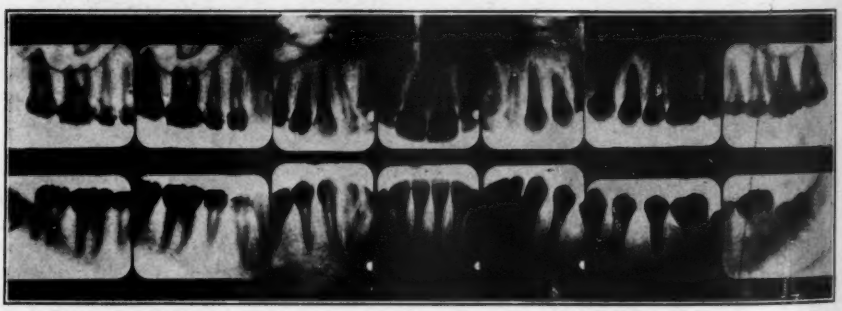

Fig. 11.—Roentgenograms of teeth after treatment. The first molar space is occupied by the second molar. The crown of lower right third molar is in favorable position to occupy space of second molar.

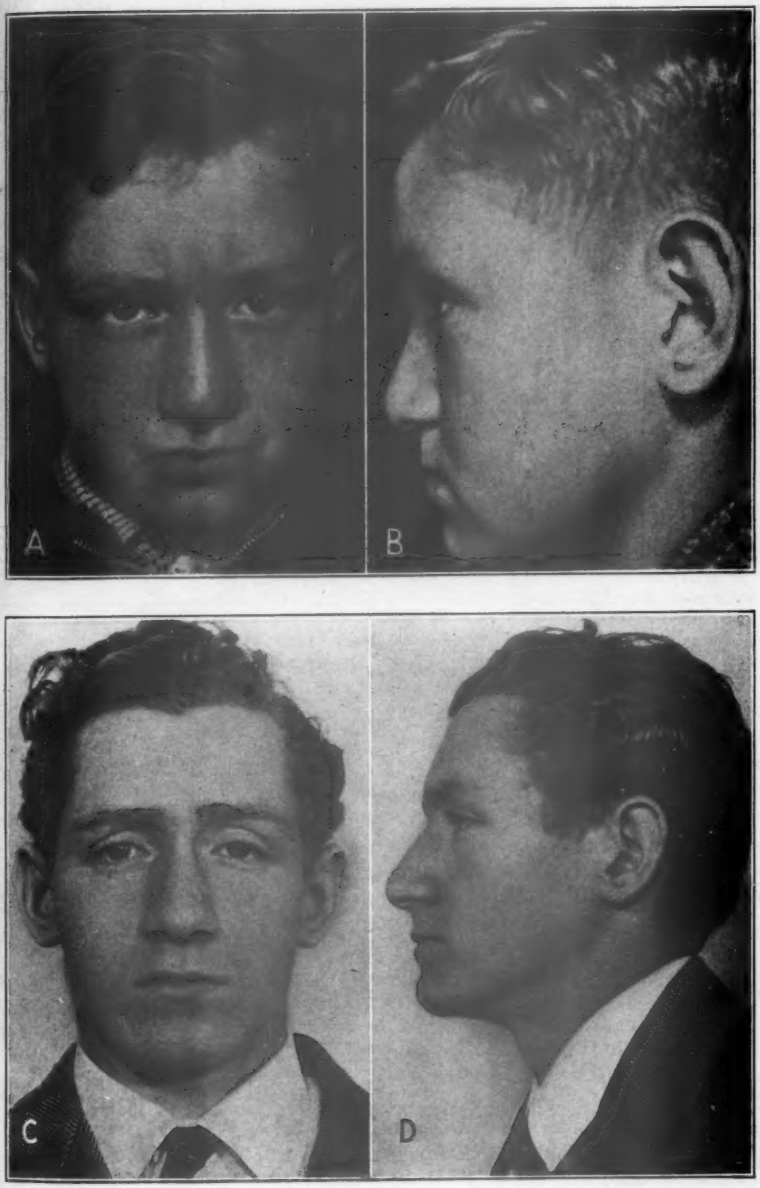

Fig. 12.—A and B, front and profile views of case before treatment. C and D, front and profile views after treatment.

gage, was locked into the individual brackets. The plan of treatment was to establish sufficient vertical height in the posterior part of the lower jaw by elevating the posterior teeth and depressing the anterior teeth; also to move the right second bicuspid and second molar mesially. With the aid of coil springs and eyelets (Fig. 2), the right first bicuspid was brought into normal position. The second bicuspid was moved mesially, and, by means of intermaxillary elastics, the second molar was moved into the position normally occupied by the first molar. The adjustments for increasing the vertical height of the bicuspids and molars were accomplished by bending the arch wire occlusally posteriorly from the cuspids and anteriorly from the first molar. (Fig. 7.) When the vertical height was established, the wire was straightened to elevate the second molars. The increase in vertical height of the mandibular teeth is shown diagrammatically in Figure 8. A favorable curve of Spee was obtained by the use of this technic, as the models of the finished case disclose. (Fig. 9.) The appliances were removed before the slight spaces on the right side were completely closed because this stage had been reached at the beginning of the summer and it was believed that the posterior teeth would move mesially by themselves. The photographs and roentgenograms of the finished case before and after treatment are shown in Figures 10, 11 and 12, A, B, C and D. The total time required for the treatment with the modified edgewise arch was eighteen months.

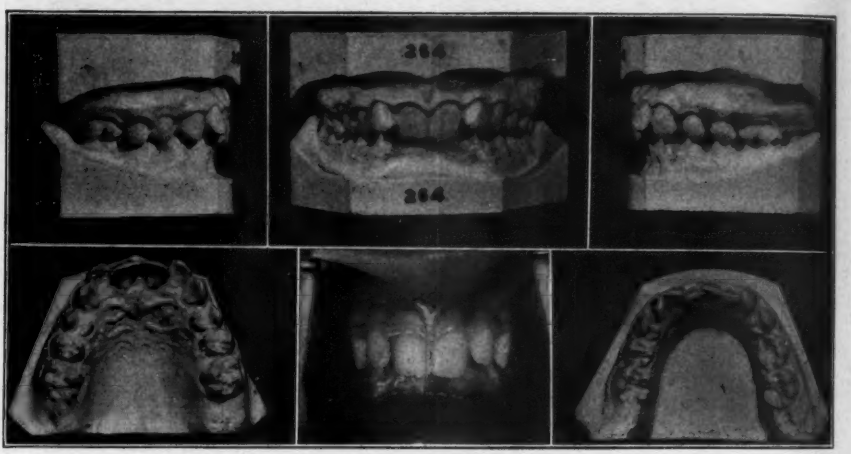

Fig. 13.—Casts and intra-oral view of case before treatment; Class II, Division 2, in child aged 12.

Fig. 14.—Protrusive position of mandible showing deficiency in vertical height of lower posterior teeth.

The casts in Figure 13 are those of a child, aged 12. This type of malocclusion, Class II, Division 2, responds most favorably to the modified edgewise technic. The key to the successful treatment of this case is the correction of the overbite, in addition to the crowded arches. To accomplish this, the occlusal plane in the upper and lower arches must be flattened. In the lower jaw, the

Fig. 15.—A and B, front and profile views before treatment. C and D, front and profile views after treatment.

Fig. 16.—Models and intra-oral view of finished case.

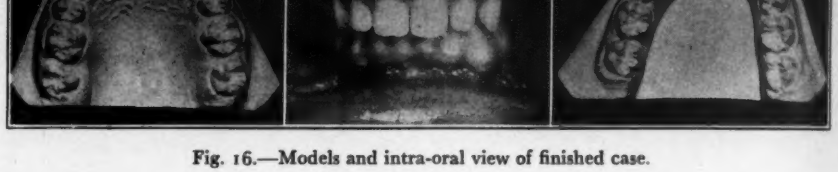

Fig. 17.—Roentgenograms of teeth before treatment.

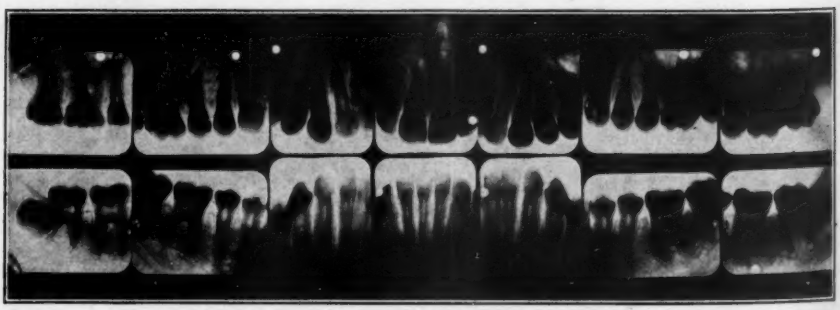

Fig. 18.—Roentgenograms of teeth after treatment.

"flatness of the plane" merely means increasing the vertical height of the posterior teeth. In the upper arch, the depression of the central incisors will help establish a more desirable occlusal plane. An idea of the vertical height necessary in the mandible can be obtained from the illustration of the lower teeth in protrusive position. (Fig. 14.)

The same technic was followed in this as in the previous case described. By banding all teeth (bands occupying the middle third of the crown) and inserting a flat ideal arch wire, expansion and vertical alinement occurred automatically. In the mandibular area, the elevation of the posterior teeth was increased by the bends in the wire previously described. (Fig. 7.)

The use of intermaxillary elastics to correct the distal relationship of the mandible was the last step. The widening of the upper arch and the depression of the lower anterior teeth released the mandible from its distal relation and permitted it to move forward to a more nearly normal anterior position. The models of the finished case are shown in Figure 16. The photographs and roentgenograms before and after treatment are shown in Figures 15, A, B, C and D, 17 and 18.

CONCLUSION

While the modified edgewise mechanism is not offered as an orthodontic panacea, it has a definite place in the treatment of malocclusion. It is simple to operate, once a good band-making technic has been acquired. A predetermined ideal arch wire to fit each individual case marks an advance over standardized arch forms, such as Hawley's. The technic involves a minimum of arch manipulation and eliminates any complicated bends in the arch wire. This technic is especially useful in Class I and Class II, Division 2, types of malocclusion. Class II, Division 1, cases, in my experience, both in private practice and in the clinic of the Hospital for Joint Diseases, are best handled with a plain labial and lingual appliance.

BIBLIOGRAPHY

1. SVED, ALEXANDER: Principles and Technique of Modified Edgewise Arch Mechanism. *Am. J. Orthodontics,* 24:635, July 1938.

2. STEIN, S. H.: Rationale of Treatment with Modified Edgewise Arch Mechanism. *Am. J. Orthodontics,* 27:648, November 1941.

3. *Idem:* Correcting Dento-Facial Disharmonies Through Orthodontics. *Bull. Hosp. Joint Diseases,* 3:54, April 1942.

4. ANGLE, E. H.: Latest and Best in Orthodontic Mechanism. *D. Cosmos,* 70:1143, December 1928.

509 Madison Avenue.

GRINDING FOR RELIEF OF OCCLUSAL TRAUMA ASSOCIATED WITH PERIODONTOCLASIA

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ONE of the important phases of the treatment of periodontal disease is the study of the occlusion and interpretation of local signs to determine whether the tissues are receiving traumatizing stresses. The need for attention to this is summarized by Orban's (1939) statement that a "traumatized tissue may more easily become infected and inflamed, and inflamed tissue will yield more easily to trauma."

It is not the province of this paper to discuss the histologic aspects of trauma, nor, again, the theoretical question of whether trauma is the cause of inflammation and pocket formation. Instead, an effort will be made to portray the clinical findings, with suggestions for amelioration as far as practicable.

Experience has demonstrated that periodontal treatment by the smoothing of root surfaces, institution of thorough home care and consideration of systemic factors, dietary and otherwise, is not always sufficient. In many instances, more satisfactory tissue response and maintenance of health occurs if the occlusion is so adjusted as to give the most equitable division and distribution of forces. For a number of years, this subject was studied and written on by Stillman, Bricker, House, Box and Merritt. Their contributions are the basis of present methods, which have been ably developed and described by many recognized writers on the subject.

Read before the Section on Periodontia at the Seventy-Eighth Annual Midwinter Meeting of the Chicago Dental Society, February 26, 1942.

TISSUE RESPONSE TO STRESS

The response of tissues to stress has been reported by a number of others, as well as Coolidge (1938), who, after studying the periodontal tissues of human jaws, stated that "abnormal or excessive functional stress resulted in pathologic changes in bone, periodontal membrane and root surfaces." But it is readily observed that seemingly equal stresses have different effects in different mouths. A certain pounds-pressure or type of stress causes traumatic symptoms in one mouth, but not in another.

When there is a balance between applied occlusal stress and tissue resistance, the occlusion is physiologic, according to Box (1927). Merritt (1934) has said, "It is probably true in most instances that loss of balance is due, not to excessive occlusal strain, but to some condition of the periodontal tissues which robs them of their ability to withstand normal masticatory stress." Since it is often difficult to diagnose or treat the systemic conditions determining the status of the periodontal tissues, it is necessary to take steps to preserve the integrity of the tissues by limiting the functional stress or amount of work expected of these tissues.

TYPES OF STRESS

Stresses upon the teeth may be vertical or horizontal. In vertical stress, the force is directed toward the long axis of the tooth and all the tissue surrounding it resists the force, although the anatomic structure of the root allows somewhat greater stress in certain areas. By impingement on the periodontal membrane,

vertical stress, if excessive, may cause injury and sensitiveness of the membrane, even at times initiating pulp disturbances.

In horizontal or lateral stress, the force is directed at right angles to the long axis of the tooth, producing a turning effect so that the periodontal membrane is compressed in the cervical root area, from just below the bone crest on the side away from the point of application of the force and in the opposite apical area. Thus, only a part of the tissues about the tooth are, from a mechanical standpoint, providing reciprocal force. Therefore, the pressure, instead of being distributed all about the root, is intensified in two small areas. The degree of stress and length of time that it operates

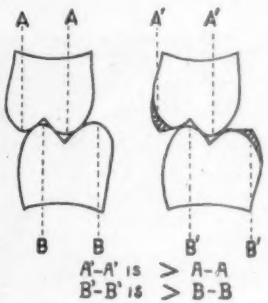

Fig. 1.—Contours produced by wear, with increase of surface contact-area during functional movements. The proximal contours favor the forcing of food under the gingival margin. A'-A' is greater than A-A. B'-B' is greater than B-B. Grinding of areas indicated by shading will reduce functional stress.

determine, in part, the tissue response. If the stress is too great for the supporting tissues, teeth tend to shift, and bone loss, with pocket formation or gum recession and mobility, is observed.

Horizontal force is actually applied to the tooth during function in a tangent or oblique direction, which, according to the principles of physics, resolves itself into vertical and horizontal components. The "normal" position of anterior teeth is such that, even in centric occlusion, these teeth are subjected to tangential stress. This is a distinct mechanical disadvantage to the integrity of the investing tissues. The posterior teeth, however, provided cusps are not too deep and positions of the teeth are normal, receive their stress vertically in centric occlusion. In lateral jaw relationships, posterior teeth too are subjected to tangential stress.

LEVER ACTION

The lever action of the tooth in its alveolus is also a basic factor. The turning effect of a force depends not only on the amount of force, but also upon the distance of its line of action from the fulcrum. Thus, the longer the part of the tooth above the bone, the greater the

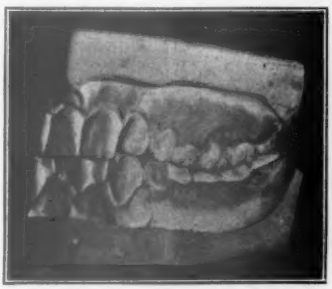

Fig. 2.—Upper lateral incisor receiving stress from lower cuspid, which usually results in adverse tissue changes around incisor. The buccal tissue loss on the first molar is associated with the fact that the lower crown has an occlusal contact area much greater than normal and with an attempt at relief of the upper cusps by grinding off the cusps at right angles, thereby also increasing the occlusal contact area.

turning effect of the applied force.

Those teeth with crowns naturally short in proportion to long roots, e.g. the square type, firmly surrounded by bone, are mechanically stable. Such teeth wear during function and maintain their mechanical advantage. They show signs of receiving traumatic force only when some other factor, for example bone loss due to periodontal disease or inlays that

are too high, disturbs the favorable lever balance.

Teeth with long crowns, common to the nervous or more artistic type of person, will even, when bone crests are at normal levels, bring about traumatic changes in the tissue because of the accentuated force created by the length of the lever projecting above the bone. Even in young adults, such teeth soon show gingival recession in spite of good care. The bone crest loss that results intensifies the previous mechanical fault by further increasing the lever length. Because of the influence of the length of the lever, care must be exercised in any restorations for opening the bite. The increased leverage on the restored teeth may initiate local tissue changes that will defeat the effects of the more equitable distribution forces upon the other teeth.

Fig. 3.—Teeth not in esthetic levels. The upper lateral incisor was the only upper tooth in contact in the protrusive position; the upper left central incisor the only upper tooth in contact in the left latero-anterior position. The teeth receive stress from irregularly placed lower teeth. The incisal levels are due to lack of wear because of both looseness of teeth and extrusion resulting from severe inflammatory conditions localized about these teeth. With grinding alone to esthetic levels, which distributed the stress over a number of teeth, the aching and soreness was promptly relieved. With scaling and regular home care of the mouth, the teeth and tissues have been maintained in excellent condition for ten years, despite the greatly lessened amount of investing tissue support.

ANATOMIC FORM

The normal arrangement of teeth and their proper anatomic forms are such that food slides down the buccal, labial and lingual surfaces without packing against the gum margin, and thus the soft tissues and bone are protected from irritation and disease. This function is lost when anatomic variation, malposition, an incorrect restorative form or improper wear results in surfaces no longer protective. Furthermore, such variations may favor the application of adverse occlusal stresses.

CLINICAL SIGNS OF TRAUMATIC OCCLUSION (OCCLUSAL TRAUMA)

1. *Lack of Wear.*—To preserve physiologic balance, there should be functional wear of the teeth. Continuous eruption of teeth is considered normal. In that case, height of the tooth crown above the gingival margin, which acts as an alveolar lever, and the vertical jaw dimension will be increased unless compensating wear occurs. With normal periodontal structures and tooth relationship, such wear takes place occlusally and proximally in the act of mastication.

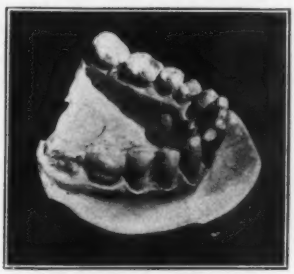

Fig. 4.—Broad incisal areas of lower anterior teeth with reverse wearing planes; i.e., lingual slope. Adjustment is made by grinding the labial area to simulate normal tooth form.

Unworn cusps or incisal edges of occluding adult teeth are therefore clinical evidence of the transmission of undue stress to the supporting tissues. This is true even when the occlusion is "normal"; that is, with a proper arrangement of inclined planes.

Lack of wear may occur when teeth are not held rigidly enough, as is the case when they are large in proportion to the bulk of bone about them, either naturally or because of pathologic loss of bone, when roots are too short, or when inflammatory or systemic changes weaken supporting structures.

2. *Excessive Wear (Fig. 1).*—Wear itself is not a sign of physiologic occlusion. Degree of wear and position of wear are significant. Wear should not be so excessive that cusp form is grossly altered. When teeth are worn so that broad cuspal surfaces are in contact during the functional movements of the mandible, tissues receive too much stress.

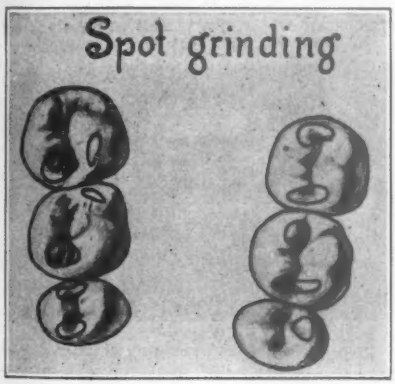

Fig. 5.—Spot grinding that lessens stress in central occlusion, but does not affect lateral relationships appreciably.

The larger the occlusal contact-area of the tooth, the greater the pressure required to cut through the food; that is, a blunt area will not penetrate the food as readily as will a pointed area. In addition, during the various movements, the teeth are in contact over a continuous plane instead of touching at just a point.

Another form of undue wear is that in which facets or concavities are formed so that enamel stands high around exposed dentin. There is generally no spillway for the ready elimination of the food, and a great deal of torque is applied on the tooth in the resultant intensified "mortar and pestle" action. Sometimes, such areas may be ground to provide spillways and to simulate more normal tooth form, whereupon abrasion progresses much more slowly. When there has been excessive loss of contour, it is often wiser to restore cuspal or occlusal contours with fillings, which may necessitate opening the bite.

3. *Position of Teeth.*—Other things being equal, teeth in normal occlusion are less likely to transmit injurious stresses. But, as has been explained, when cusps are unworn, such occlusion may be causing traumatic changes either because the lever is too long or because tangential forces are excessive on long, sharp cusps. Also, in central occlusion, cusps should not be too closely and positively interdigitated. Some freedom of movement or play is best.

Although traumatic occlusion and malocclusion are not synonymous, it is easier to visualize the possibility of harmful stresses when teeth are out of normal position. All cases of malocclusion, either with a full complement of teeth or the result of shifting and drifting because of existing spaces, should be examined for evidence of stresses greater than the tissues can withstand.

Any variation from the recognized esthetic position and the normal incisal and occlusal levels must be noted, to determine whether the tissues are properly tolerant. Crowding of anterior teeth often occurs. Effects may be adverse when a lower incisor is in labial position, even though it may still be of the proper incisal level. An upper lateral incisor may receive too great functional stress from contact with a lower cuspid, to the detriment of the upper tooth. (Fig. 2.)

4. *Investing-Tissue Changes.*—Since position and shape of teeth alone do not determine whether the occlusion is physiologic or traumatic, one must observe the clinical response. In some instances, the

supporting tissues may so adjust themselves to the applied forces that clinically the occlusion must be termed physiologic. In others, certain clinical changes are manifested which are neither arrested nor eliminated unless there is a decrease in the amount of force received by the supporting tissues. Such clinical signs will vary in degree; at times being so slight that they may be overlooked unless the dentist is exceedingly alert. They include mobility, vague referred pains, marginal gingivitis, subgingival calculus, gingival clefts, shifting of teeth, shiny facets on crowns or inlays, open contacts and food packing. None of these symptoms is in itself diagnostic of traumatic stresses, but must be carefully differentiated. Deep pockets or recession about a single tooth when adjoining teeth show no such changes are certain to be related to the occlusal stress received.

Mobility, too, is a frequent sign of adverse stress, and may be detected by digital manipulation of the tooth, and by placing the finger along the buccal-labial surfaces or watching for signs of movement during the various mandibular excursions. Habits may have been developed to avoid sensitive or interfering teeth, so, because of their diminished function, these teeth may not show typical signs of trauma.

Models will assist in the study of gross occlusal relationships and particularly in deciding on the method of treatment; that is, whether to grind, restore or proceed with orthodontics. The method of choice is modified by economic considerations and by the degree of interference necessary. Grinding should be used primarily when comparatively minor changes are needed, and sometimes in conjunction with the other two methods.

When grinding has been decided upon, models will aid the beginner in finding interfering cusps and in preliminary planning as to areas to be ground. But diagnosis depends on careful study of the mouth itself, bearing in mind all that has been said about position, shape of teeth and tissue signs. If there are unrestored spaces in the mouth, the most effective results from grinding can be expected only if restorations are then made to stabilize the new relationship.

Fig. 6.—Left, central relationship. Right, protrusive relationship; indicating interference of third molar, causing local tissue changes and "neuralgic" or ear pains, and promoting further buccal and forward movement of second bicuspid.

GRINDING PRINCIPLES

Grinding is done either to shorten the crown or to change cusp relationships and crown forms. Certain general rules should be observed during grinding.

1. Proper tooth form should be kept in mind.

Commonly, in correcting for lack of wear, or when the alveolar support has been reduced, it is necessary to decrease the lever formed by the amount of tooth projecting above the bone. We

should not, however, shorten the lever or attempt to change cusp relationships by grinding the tooth at right angles to the long axis. The proper cusp form on posterior teeth and incisal slopes on anterior teeth should be maintained or established. (Fig. 1.) Otherwise, although the leverage has been decreased, the benefit has been nullified by an increase in occlusal area contact, so that even greater pressure is exerted upon the supporting tissues during mastication. Teeth should not be ground to the point of mutilation, although a great deal of grinding may often be done, particularly upon anterior teeth, without causing deformities. In fact, adjustment of irregularly placed anterior teeth often results in more pleasing effects.

2. Normal tooth relationship should be kept in mind.

When two teeth in opposite jaws are bearing the stress, sometimes one and sometimes both require grinding. By consideration of the normal ideal incisal or occlusal line, the proper surfaces can be chosen. (Fig. 3.) Briefly, some points to remember are: The upper lateral incisor should be about 1 mm. shorter than the central. The cutting edges of the lower anterior teeth should be almost level or on a slight curve, with the central incisors lowest. The cutting edge of the mesial half of the lower cuspid should be in symmetrical labial alinement with the incisors, the distal half alined with the bicuspids and molars. The upper molars and bicuspids should be so placed that the lingual cusps are situated lower than the buccal cusps; that is, a straight line from the lingual cusp of the right to the lingual cusp of the left should not touch the buccal cusps; while the buccal cusps of the lower molars should be higher than the lingual cusps. Ordinarily, because of the tangential stress applied to anterior teeth when they are in normal occlusion, it is better if they just miss being in contact when the jaws are in centric relationship.

3. Stress should be distributed over as many teeth as is feasible.

Since pressure is equal to the force divided by the area, the greater the distribution of force, the less the pressure on any single area. But in spite of the desirability of equitable distribution, in deep overbite cases, posterior contact in protrusive position cannot be obtained by grinding.

4. All relationships should be studied carefully in the mouth before grinding is started.

We should determine whether only a few teeth require adjustment, or whether more general grinding is needed. It may be necessary to shorten all or many of the crowns if there has been lack of cusp wear or if there has been generalized alveolar bone loss. In that case, both lingual and buccal cusps may need reducing.

When vertical bite-opening should not be changed appreciably, care must be taken that the proper cusps be reduced, so as not to interfere with balancing. Cusps that maintain contact with opposing tooth surfaces in centric occlusion should also maintain contact in lateral movements of the jaw. Normally, the upper lingual cusps and lower buccal cusps establish the maxillomandibular opening. To keep this relationship, the correction should be made on the lingual cusps of the natural lower molars and the buccal cusps of the upper molars. If slopes of cusps are in area-contact, the cusps are reshaped to point contact. Seldom is it wise to grind teeth entirely out of occlusion.

Teeth with restorations may require grinding on surfaces not usually ground on natural teeth. For example, in a restoration covering the lingual cusps of upper molars, either an insufficient amount of tooth may have been removed or restoration may have been overcontoured. In such instances, the upper lingual cusp would need to be ground. Unless teeth are quite mobile, metallic inlays will show facets or burnished spots to guide

grinding. Many times, the trauma evidenced could have been avoided if the occlusion had been corrected before construction. This is more notably true of cuspid three-quarter crowns. These teeth so often bear an overload in lateral relationships even before the restoration is made. The gold with its facets has only made the previously existing overload more obvious.

Molars and bicuspids that have extruded or tipped because of lack of opponents should be ground, extracted or moved by orthodontic means before spaces are restored, if functional occlusion is to be obtained. Marginal ridges and contours should be examined to see that they conform to the normal for the mouth. Even so, because of the variation in the wearing properties of different filling materials and of natural teeth, restorations need to be checked at intervals to determine whether adverse forces have developed.

5. Stones should be of proper size and shape.

Small rounded edge stones (e.g. Miller's Nos. 253 and 254) are excellent for selective spot-grinding. For shaping incisal contours, a wheel stone (five-eighths by one-eighth inch) is suggested. The tooth should always be stabilized with the fingers and stones be kept wet during grinding.

6. Balancing of an occlusion in one visit should not be expected unless the changes are exceedingly minor.

After a period in the chair, the patient's jaw movements become abnormal and the dentist's discrimination lessens. Loose teeth tend to shift position after relief, and one cannot always estimate the amount of such movement.

GRINDING PROCEDURES

With these general principles in mind, the occlusion should be adjusted whenever it seems advisable. Recommendations vary somewhat as to whether centric or protrusive occlusion should be adjusted first. Although no single position can be adjusted without consideration of the effect upon relationships in all other positions, a combination of protrusive correction and correction for esthetics is a satisfactory first step, particularly for those learning the technic of grinding.

The patient is instructed to bring the lower jaw forward. After the contact areas have been noted, grinding is done to distribute the stress over as many teeth as is feasible. If, in this position, posterior contact can be obtained as well as anterior, the tissues will respond more favorably. In any case, changing the load from two to eight, ten or twelve anterior teeth will be significant.

Frequently, it will be noted that the labial enamel plate stands higher on the lower teeth than does the lingual plate, even though the incisal levels may be harmonious. (Fig. 4.) There is then a sharp interference during function, with force exerted against the labial bone instead of the lingual. This will be intensified whenever dentin between the enamel plates has been worn away to form a concavity. Such teeth are usually quite mobile and should be modified by grinding or restoration, according to the degree of abrasion.

The second step is correction in centric occlusion. Placing the finger along the teeth while having the patient give a series of quick chopping bites in position will sometimes demonstrate the cusp interference. If the patient bites into strips of softened 20-gage wax, interfering areas will be indicated more easily than with carbon paper. The usual pink baseplate wax is so thick that it causes displacement of mobile teeth and abnormal jaw relationships and so is not suitable for checking occlusion. Closure is more typical if the marking substance is placed on the right and left sides at the same time. A colored pencil may be used to mark the contacting areas through the cut or

thin wax spots. The best place to grind can then be selected.

In reducing molars, it must be remembered that the ratio of the molars and incisors on "closure" varies. According to House (1926), for every 0.33 mm. of wear or reduction posteriorly, 1 mm. is needed anteriorly. This is of distinct advantage in adjustment of open-bite cases, but care must be taken when there is anterior contact, since slight relief posteriorly may cause excessive pressure anteriorly.

Posterior proximal contact points are sometimes forced open by improper occlusion. This may be brought about by the wedging action of a cusp directed immediately toward the embrasure in a wedge or plunger action. But, often, separation occurs, particularly between upper teeth, because the levels of the marginal ridges on the approximating teeth are different, or there is excessive stress upon the mesial planes of the cusps of the maxillary teeth, forcing these teeth distally.

When separation has taken place to a degree determined by cuspal function, further shifting is not likely to occur, except as a result of food wedging. Study of casts, carbon paper marks or wax bites will no longer clearly indicate the cuspal interferences that were responsible for the shifting. Experience has shown that in the case of open contacts between maxillary molars, mesial planes of the cusps of these teeth should be ground, generally without adjustment of the peak of the cusp. (Fig. 5.) When there has been no recognizable wear on the lower cusps contacting these mesial inclines, such cusps may need grinding also. Without wear, there will have been no normal shortening of the tooth to compensate for the continuous eruption. Judicious grinding may, with occasional use of ligatures, permit natural closure of the space. This is especially desirable when tooth surfaces are intact, and restorations are not needed otherwise.

Before restorations are depended on to close open contacts and thus stop food lodgment, the occlusion should be carefully checked to determine that cusps are no longer interfering. If this is not done, the operator will be disappointed to find reopening after restoration.

After adjustment in centric position, the lateral relationships are checked, as the third step. Points of interference are observed by eye, and with the aid of carbon paper and wax. The cuspids often require grinding. Both upper and lower may need shortening, but normal relations in centric occlusion should not be disturbed. Schuyler (1935), who has diagrammed this situation, says that by adjustment on the upper tooth:

> Contact of the cuspids is retained in the centric position and harmony of guiding inclines and distribution of stress in the eccentric position established. The removal of the [designated] area of the lower cuspid would eliminate premature contact in the lateral position, but would take the cuspids out of contact in the centric and a portion of the eccentric relation.

Third molars too are many times the interfering teeth, even when having no opposing third molar. (Fig. 6.) In such an event, the probable extrusion of the tooth brings about side pressure against the distal part of the last tooth of the contacting jaw, disturbing the tooth or even the entire jaw relationship. In other cases, the lower third molar may carry the entire load in either protrusive or lateral jaw movements. Sometimes, extraction of one or several grossly interfering teeth may be better than grinding. Upon completion of occlusal adjustment, the patient should feel that the teeth are comfortable in the various functional relationships.

CONCLUSIONS AND SUMMARY

Judgment based on experience is the answer to many problems in grinding. General rules can be established, but they

must always be modified according to the individual case.

"Age does not seem to be a factor in the susceptibility of the periodontal tissues to excessive stress, but clinical observation seems to indicate that damage in these tissues is more readily repaired in the young than in the old." (Coolidge, 1938.)

Since grinding is most effective when minor adjustments only are necessary, the dentist should be ever alert to early signs of trauma. Excessive grinding, which produces visible deformity of the tooth, is almost never advisable, although it may be done occasionally on one or on a few teeth in the mouth.

Careful adjustment of interfering cusps and planes will result in relief of clinical symptoms of overload with improvement in appearance, and function and in the maintenance of healthy investing tissues.

BIBLIOGRAPHY

BOX, H. K.: Studies in Periodontal Pathology. Toronto: Canadian Research Foundation, 1927.

COOLIDGE, E. D.: Traumatic and Functional Injuries Occurring in Supporting Tissues of Human Teeth. J.A.D.A., 25:343, March 1938.

HOUSE, M. M.: Traumatic Occlusion as Factor in Periodontia: Detection and Correction. J.A.D.A., 13:625, May 1926.

MERRITT, A. H.: Occlusal Traumatosis: Cause, Effect and Treatment. *D. Cosmos*, 76:524, May 1934.

ORBAN, BALINT: Traumatic Occlusion and Gum Inflammation. *J. Periodontol.*, 10:39, January 1939.

SCHUYLER, C. H.: Fundamental Principles in Correction of Occlusal Disharmony, Natural and Artificial. J.A.D.A., 22:1193, July 1935.

PERICORONAL AND VINCENT'S INFECTIONS; BACTERIOLOGY AND TREATMENT

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WITH the induction of 18 and 19 year old youths into the armed forces of the country, the probability of more or less severe infections of the soft tissues surrounding erupting third molars is a problem which will have to be met.

Infection of the tissues surrounding the crown of an erupting tooth, known as pericoronitis, occurs most commonly in the mandibular third molar area, occasionally in the maxillary third molar area and rarely around other teeth. The tissues around a completely unerupted tooth are never involved. It is only when there is an opening from the surface to the dental follicle or to the tooth itself, subjecting the submucous tissues to invasion by the bacterial flora of the mouth, that the tissues become affected and, many times, infected.

As the follicle atrophies, it is converted into a thin band of dense connective tissue. Inflammation of this band of connective tissue, some of the fibers of which form the *ligamentum circulare*, can occur as a result of trauma during mastication. Saliva, mucus and bacteria gain access to the tissues distally from this ligament. As healing takes place, this connective tissue band undergoes scar

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formation with contraction and the bacteria and débris are enclosed within the tissues.

If the patient's resistance is good and he has no vitamin deficiency, the defensive factors of the body attenuate the organisms. Mild exacerbations that may occur at periodic intervals in response to traumatic irritation are known as recurrent chronic pericoronitis. The treatment for this condition is excision of the flap with removal of the bone overlying the distal area of the tooth. The flap can be removed with the scalpel or electrosurgical knife. The important procedure is removal of sufficient tissue to insure that, when contraction takes place, the entire crown will be exposed.

However, under constant traumatic influences and low resistance, a good culture medium is developed within the tissues enclosed by the *ligamentum circulare*. This medium is composed of all the essentials for the multiplication and growth of bacteria. It contains blood serum and the other constituents of exudation and transudation. In this medium, what may have been a bacterial affection becomes an infection with all of its objective and subjective symptoms.

Given a clean healthy mouth, and the absence of any traumatic or irritative influences, such as the crushing of tissues by an opposing erupted tooth, the tissues remain unaffected and continue so until the tooth is fully erupted. Since the mandibular third molar is the tooth most commonly involved, and since the locale of this tooth is one through which serious complications may arise, the mechanism of infection around this tooth will be discussed.

In order that an accurate diagnosis may be made and proper treatment be instituted, the process of normal tooth eruption in relation to the disappearance of the dental follicle must be understood. As the mandibular third molar erupts through the bone to reach the overlying oral epithelium, the dental follicle begins to undergo pressure atrophy. When the first cusp breaks through the mucous membrane, that part of the follicle which had covered this cusp has already undergone complete atrophy, with the result that the enamel becomes visible. Although that part of the follicle which had covered the erupted cusp has now disappeared, the follicular tissue covering the rest of the unerupted part of the crown of the tooth is still intact.

If the distal cusps of the tooth are covered by bone or have reached an impediment to the process of eruption, we now have a condition in which part of the tooth crown is covered by a flap of mucous membrane under which is the non-atrophied part of the dental follicle, and an opening leading under the flap to the tissues between the oral epithelium and the follicle, or between the follicle and the tooth.

As the exudate increases in amount, it may force itself through the *ligamentum circulare* or through some point in the tissues surrounding the tooth, and thus drainage becomes established. The more acute symptoms subside, but soreness and tenderness of the palpable submandibular glands persist. This condition is known as subacute pericoronitis.

A smear taken from under the flap or from the discharge shows various organisms, the staphylococcus, streptococcus and Vincent's organisms being the most numerous.

If there is a niacin, riboflavin and ascorbic acid deficiency, there will be a congestive gingivitis present, and the flap overlying the partially erupted third molar is red and swollen and bleeds easily. The Vincent's organisms present become predominant and the margins of the flap become necrotic. When pus or a serous exudate fails to find a point of exit, it may accumulate buccally, lingually or distally.

No surgical measures should be re-

sorted to in the presence of a subacute pericoronitis. One school of thought teaches that, in order to cure a condition, its cause must be removed. If the condition of the tooth is the cause of the subacute pericoronitis, the tooth should be extracted. I have seen fatal meningitis, cavernous sinus thrombosis and Ludwig's angina follow such a procedure.

These infections should be treated conservatively. The agents that have been used locally are methylene blue, gentian violet and brilliant green. Oxidizing agents and arsenicals have been used. In my opinion, the treatment of a subacute pericoronitis is a matter of releasing the pressure of the exudate, raising tissue resistance and eliminating irritative or traumatic conditions; for example, by extracting an upper third molar that may be crushing the tissues when the mouth is closed.

Pressure is released and drainage is secured by inserting a small drain under the flap and into the pocket of accumulated exudate, using a blunt instrument and causing no laceration of the tissue. Tissue resistance is raised by forcing fluids with a high vitamin C content and the use of vitamin B_2 complex (riboflavin and niacin). Hot intra-oral irrigations with physiologic sodium chloride solutions are given hourly to aid in the absorption of the products of inflammation.

I find that this treatment gives prompt relief and, after forty-eight hours, the tooth can safely be extracted without fear of complications. When there is a preponderance of Vincent's organisms present with necrosis of the flap, the use of zinc peroxide, as suggested by Stephen P. Mallett, of the Boston City Hospital, has proved very effective. A mixture of 2 teaspoons of zinc peroxide in a quarter of a glass of water is made and is thoroughly stirred. Each mouthful is held for one full minute and once a day a mouthful is held for five minutes.

If subacute pericoronitis remains untreated, it may become acute. The symptoms depend on the predominating organisms and the area involved. When the predominating organism is the staphylococcoccus, pus forms, tending to localize and become walled off. If the buccal aspect of the tooth is involved, the posterior superficial cervical lymph nodes become swollen and the condition is called pericoronal abscess with posterior cervical adenitis.

If the lingual aspect of the tooth is involved, there is a tendency for the swelling to spread posteriorly to the peritonsillar tissues and medially to the base of the tongue. The deep cervical and occasionally the retropharyngeal glands become involved.

The treatment of the pericoronal abscess is directed to securing resolution or pointing, by extra-oral and intra-oral heat. Hot flaxseed poultices or hot magnesium sulfate packs are applied externally after the face and neck have been anointed with vaselin to prevent blistering. Intra-orally, irrigation half hourly with a hot physiologic sodium chloride solution is of value. If resolution does not occur, either intra-oral or extra-oral incision and drainage may have to be performed, according to the area of pointing.

There are three cardinal surgical principles which should be followed before resorting to surgical measures in a pericoronal abscess. Localization must be allowed to occur. Fluctuation must be permitted to take place. In the interim, a certain amount of immunity to the organisms causing the infection is acquired. Drainage must be adequate. A small incision through which a drain is inserted serves as a bottleneck and blocks drainage. When the acute condition has subsided, the tooth can be extracted safely.

When the streptococcus is the predominating organism, the result is a cellulitis. If there is buccal involvement, the ex-

ternal surface of the jaw and neck is swollen and indurated. Trismus is marked because of temporal and masseteric spasm. There may be a slight serosanguinous discharge from around the gingiva of the tooth. The swelling may spread into the temporal fossa. The most serious complication arises when the lingual surface of the tooth is involved and the streptococcus is the predominating organism.

In the beginning, there is the unilateral cellulitis of the floor of the mouth. The floor is raised, swallowing is difficult and the patient becomes dehydrated. If the condition is not controlled, the infection spreads through the median raphe and there is a complete cellulitis of the floor of the mouth. This condition is fulminating and the infection may involve the glottis, causing respiratory embarrassment. At this time, we are dealing with a Ludwig's angina.

The treatment of acute streptococcic pericoronitis demands mature judgment and experience. If possible, the patient should be hospitalized and sulfonamide therapy instituted. The drugs of choice are sulfanilamide and sulfadiazine, the latter being less toxic, but the former more specific for streptococci. When these drugs are being given in doses large enough to be effective, frequent blood counts must be made to note possible beginning hemolytic anemia or agranulocytosis. The sulfa blood level must be determined at frequent intervals.

Even though these drugs often obviate surgical intervention, the other well-recognized forms of treatment must not be neglected. The use of intra-oral and extra-oral heat, forcing of high vitamin C fluids and other supportive measures are necessary.

Pericoronal cellulitis does not tend to localize, nor does fluctuation occur unless marked staphylococcic contamination takes place. Early incision for drainage and relief of congestion is indicated to prevent massive tissue destruction.

If the condition is complicated by the presence of Vincent's organisms, resolution is prolonged. The swelling is indurated and diffuse. When drainage occurs, the discharge is especially foul and is serosanguinous. Prompt and energetic treatment of acute pericoronal cellulitis may prevent more serious complications.

The flaps overlying partially erupted mandibular third molars are in many cases the probable source of recurrent so-called Vincent's infection. I say so-called because Vincent's stomatitis or gingivitis has been and still is more or less of a mystery. There are a number of questions about it that remain unanswered:

1. Are the fusiform bacillus and the spirochete of Vincent two different organisms acting in symbiosis, or does the spirochete represent morphologic change in the evolution of the fusiform bacillus?

2. Why does the action of these organisms fail to come under Koch's postulates?

3. Is Vincent's infection a disease entity?

4. Why does Vincent's infection occur in epidemics?

5. Why does Vincent's infection in one member of a family usually fail to contaminate the rest of the family in spite of lack of precautions?

6. Why does not Vincent's infection occur in edentulous mouths?

There is no conclusive evidence that cultures of the fusiform bacillus or cultures of spirochetes remain morphologically identical as they age. There is some evidence, although not conclusive, that, in cultures, the fusiform bacillus changes into the spirochetal form as it matures.

That Vincent's infection is not a disease entity can be ascertained by its lack of adherence to Koch's postulate. The injection into animals of organisms from an acute case of Vincent's infection that are cultured and isolated does

not produce the oral symptoms with which we are familiar. At the site of injection, an abscess develops without any other symptoms.

Topping and Fraser[1] report a series of experiments on monkeys which, though not conclusive, are significant. Monkeys in which experimentally a vitamin C and B_2 complex deficiency was established, if infected with organisms from cultures showed typical necrotic Vincent's lesions when the gingiva and buccal mucous membranes were surgically traumatized.

Transmission of the organisms to monkeys that had been under dietary control and were not deficient in vitamin B_2 complex and vitamin C was incapable of initiating these lesions regardless of whether or not the tissues had been previously traumatized. When the organisms were transmitted to the socket of an extracted tooth in a monkey deficient in vitamin B_2 complex and vitamin C, the socket became necrotic. In the controlled animal, no lesion developed.

Large numbers of soldiers returning from the First World War were found to be suffering with Vincent's gingivitis. They gave histories of unbalanced diets continuing for weeks at a time, especially during active combat. Citrus fruit juices, meat and fresh vegatables were difficult to get.

In 1933-1935, an increasing number of patients in private practice and in clinics presented symptoms of acute and subacute Vincent's infection. During this period, not only were children with erupted deciduous teeth seen with this condition, but there were sporadic cases of infantile scurvy.

The economic depression of the early thirties found many of the indigent unable to purchase fresh fruits, meats and vegetables. Adults who were heavy smokers exhibited more fulminating and acute oral symptoms than the non-smokers who suffered from a vitamin B and C deficiency.

It is significant that Vincent's organisms exert a secondary influence on primary conditions, these being a partial or complete vitamin B_2 deficiency plus a subclinical scurvy.

More clinical evidence that this is so can be obtained from the histories of patients in which one member of a family had been suffering from ulceromembranous gingivitis for a week or two, and had taken no precautions, and the rest of the family, when examined, exhibited no oral symptoms. Questioning invariably revealed that the afflicted member had been too busy to eat a well-balanced diet, but existed on sandwiches and coffee for weeks at a time, smoking heavily in the interim. Other histories revealed the tendency to follow dietary fads, even to undergo partial starvation. However, in some of the families existing on welfare allotments, more than one member was involved.

A puzzling question is, "Why does not Vincent's infection occur in edentulous mouths?" It is my opinion that as long as the mucous membrane is intact, there is no anerobic medium on which the organisms grow and multiply. Should a break occur in the mucous membrane of a debilitated person, an ulcer can develop, with the predominant organisms the fusiform bacillus and spirochete. Topping and Fraser's experiments in the production of noma in monkeys on a B_2 complex and C deficient diet are again significant.

Confronted with a case of ulceromembranous gingivitis, how can we best treat it? The scientific treatment for any disease is the removal of the cause. The predisposing cause is any condition that results in congestion of the gingivae and interdental papillae, with bleeding, venous stasis and transudation. This is found in the deficiency diseases, such as acute scurvy, subclinical scurvy, pseudoscurvy and pellagra. It is found in leukemia, and arises from irritation due to crowns and fillings and of flaps over

erupting teeth, especially mandibular third molar flaps, acting as reservoirs.

The first principle in the treatment, therefore, is to overcome the vitamin deficiency when this is the cause. A daily dosage of 300 mg. of ascorbic acid, 400 mg of niacinamide (nicotinic acid amide) and 20 mg. of riboflavin meets the requirements. This in itself is sufficient to cure an acute condition, because, as the tissues return to normal, the culture medium for the growth and multiplication of the organisms disappears. The period of return to normal may be hastened, however, when oxidizing agents are used locally.

So numerous are the drugs used to destroy the fusiform bacillus and spirochete of Vincent that no one of them can be regarded as specific. Anilin dyes, iodine and arsenicals have been used with more or less effect.

My best results have been obtained with 10 per cent chromic acid applied to the gingivae and followed one minute later by hydrogen peroxide. After two minutes, the mouth is rinsed with a small amount of warm water. All smoking must be prohibited.

The zinc peroxide treatment, followed by drinking the juice of one orange or grapefruit as described by Dr. Mallett,[2] is effective for destroying the organisms, since nascent oxygen is given off for a much longer period than through other oxidizing agents.

CONCLUSION

There is sufficient clinical and investigative evidence that the majority of cases of ulceromembranous gingivitis are primarily due to a vitamin B_2 complex and vitamin C deficiency; that affection with Vincent's organisms becomes infection by these organisms, and that the signs and symptoms of the disease, as we know it, are a secondary manifestation of a primary condition.

The number of cases treated by drugs only that tend constantly to recur is significant. When local conditions are ruled out and large doses of vitamin C, niacinamide and riboflavin are given, recurrence ceases.

BIBLIOGRAPHY

1. TOPPING, N. H., and FRASER, H. F.: *Pub. Health Rep.*, 54:416-431, March 17, 1939.

2. MALLETT, S. P.: Zinc Peroxide in Treatment of Mouth Infections. J.A.D.A., 29:384-388, March 1942.

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MOUTH REHABILITATION: ORTHODONTICS AND PROSTHESIS

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ORTHODONTIC procedures often solve many restorative and periodontal problems confronting the dentist. Satisfactory prosthetic reconstruction is impossible in many instances because of malposition and shifting of abutting teeth following extractions. Orthodontic movement of the malposed abutting and other teeth simplifies these conditions.

Often the statement is made that the patient is too old. Orthodontists have learned that, in many cases, age in years is not a bar to orthodontic service. If physiologic conditions are favorable, the chronologic age may be disregarded, the advisability of orthodontic measures being dependent on the extent of orthodontic procedure contemplated. The chronologic age should be used as a guide and index to prognosis. Orthodontists know that many young adults are physiologically unfit and are poor orthodontic risks. Conversely, older persons may be good risks. Patients over 50 years of age have had successful, although limited treatment, while others 18 or 19 years of age, or even younger, have been refused treatment. Chronologic age may be disregarded if the roentgenogram shows dense deposition of bone without large trabeculae. Patients must be good orthodontic risks if treatment is to be undertaken.

Dentists habitually consult oral surgeons on many matters. Often, extraction and other surgical measures are contemplated to aid in preparing the mouth for rehabilitation. Is it unreasonable to suppose that orthodontics can be an aid also? Consultation with the orthodontist might aid the dentist in planning certain cases. If the advice from the orthodontic point of view does not coincide with the dentist's plans, nothing has been lost. On the other hand, much might be gained.

The subjects, prosthesis and orthodontics, are really a combination of the two for the benefit of the patient. Orthodontic procedure is resorted to to prevent subsequent debilitation of the mouth and prosthetic procedure is really the rehabilitation of the areas of lost teeth. This statement is made to show that closer cooperation is needed between the dentist and the orthodontist for the health of the patient. It therefore behooves the orthodontist to show the dentist that he can aid him in planning many cases needing prosthetic restorations.

All means at our command should be employed to diagnose a case that the most favorable result possible may be obtained. Favorable treatment and prognosis can be assured only if there is close and continued cooperation between the dentist and the orthodontist. When called into consultation, the orthodontist must be mindful always of the fact that the patient has been lent to him by the dentist and that the patient must be returned to the dentist in good order. He must remember that the dentist must reconstruct the mouth after orthodontic treatment, and therefore repeated consultation prior to and during treatment must be a fixed procedure. Consideration

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must be given to the type of restoration that the dentist favors. The orthodontist, in all cases of cooperative effort, must consider treatment from the viewpoint of the work that the dentist must do eventually, and the dentist must be shown that the orthodontist may aid him in many of his problems of reconstruction. In case planning, consideration must be given to strain and stress on the abutment teeth. The temporomandibular articulation should be considered, if possible, so that no damage will result. The dentist must be shown where interference exists in order to avoid future trouble from his restorations. The aim need not be an ideal occlusion, but it should be a functional result.

Fig. 1.—Left: Above, insufficient space between maxillary central incisors and canines for prosthetic restoration. Below, occlusal view showing spaces between first premolars and canines and between canines and central incisors. The lateral incisors are congenitally missing. There is also a space between the central incisors. Right: Above, appearance after treatment. The space between the central incisors is closed and that between the central incisors and canines has been enlarged to permit prosthetic restoration. Below, spaces closed between the canines and first premolars.

Because an orthodontic diagnosis is necessary for a satisfactory orthodontic and prosthetic result, the employment of every possible diagnostic aid prior to orthodontic treatment is advised. A complete roentgenographic study should include a set of bitewing films, a fourteen film intra-oral series, upper and lower occlusal films, right and left 5 by 7 inch lateral plates, a right and left temporomandibular film, a hand picture and profile photographs. A set of gnathostatic casts are made according to Simon's method.[1] Basically, this method orients the dentition in the three planes of space according to the eye-ear, the orbital and the raphe median planes. These three dimensions make it possible to evaluate the denture in its relationship to the skull, the face and the dental arches. The prognosis is more evident because it is easier to determine whether the teeth should be moved up or down from eye-ear plane, forward or backward in relationship to the orbital plane and to or away from the raphe median plane. Each

tooth can be considered in its relative position also.

The dentist who refers the case is apprised of the procedure and the findings are discussed with him from an orthodontic viewpoint. He then presents the picture from the restorative angle. All possibilities and probabilities of the case are discussed again and, if possible, all plans for prosthesis after orthodontic treatment are also made before any treatment is instituted. Consideration is given to tooth position, the bone condition, the age of the patient, stress and strain, articulation and occlusion, the bite (overbite and overjet) and the anterior or posterior displacement of the mandible and maxillae.

Fig. 2.—Above, labial view of case shown in Figure 1 with prosthesis inserted. Below, lingual view. Because the bridge to the right was made without fixation on the central incisor, the tooth began to shift distally.

When teeth are missing congenitally, the dentist is usually concerned with upper lateral incisors, lower second bicuspids, upper second bicuspids and lower lateral incisors. Third molars need not be considered. In cases mutilated by extraction, any combination of loss of teeth may be considered. The dentist should visualize the condition of the mouth in the future, after loss of even a single tooth. No one knows better than the dentist that the shifting of adjacent teeth may ruin the entire denture. The mouth is not static: it is in a constant state of flux. Any slight interference will move teeth. The movement of teeth into their proper functional position after they have drifted is not always accomplished so easily.

Cases to be considered come under three general headings:

1. Mouths mutilated by congenital absence of teeth.
2. Those mutilated by extraction of teeth.
3. Those mutilated by a combination of the two conditions.

Examples of the foregoing classification will be presented.

Case A. This classic case, which is frequently encountered, shows congenital absence of the right and left maxillary lateral incisors with distal shifting of the right and left maxillary central incisors, with an abnormal labial frenum between them. There is also a mesial shifting of the right and left maxillary canines.

In a case of this type, there was no room for prosthetic replacement of teeth of normal size. An esthetic result was impossible under the conditions presented. After diagnosis, the treatment was outlined to move the central incisors mesially and the canines distally. The following appliances were used on the maxillary denture only: Gold platinum molar bands with half round lingual tubes and 0.022 by 0.028 inch buccal tubes were made. A continuous lingual appliance was used to stabilize the molar anchorage. Finger springs were soldered in position to effect movement of the canines distally and the central incisors mesially. Stops were soldered on the lingual arch mesially from the first premolars. In addition, the maxillary first premolars, canines and central incisor bands were made with Angle

brackets for the reception of 0.022 by 0.028 inch labial arch wire. All bands were cemeted to the teeth. The labial arch was stopped mesially to the molar sheaths on the right and left, and mesially and distally from both the right and the left upper first premolars prior to insertion. The labial arch was placed in the molar sheaths with bracket engagement of the upper first premolars, canines and central incisors. In addition to the lingual springs, the activating forces were figure 8 ligatures from the upper canines to the upper first premolars and between the upper right and left central incisors. The canines and central incisors were moved distally and mesially, respectively along the labial arch wire, using the arch wire as though it were a trolley. The complication presented by the abnormally low and fibrous growth of the frenum was overcome by gradual and continuous pressure exerted by bringing the central incisors into place. This caused gradual recession of the frenum. A procedure of this type is preferable to surgical interference because resection causes scar tissue, which often makes tooth movement and maintenance difficult. After retention, the bridges hold the teeth in place and maintain the pressure on the receded frenum.

The prosthesis used in this case was as follows: On the left side, a three-quarter crown carried a Steele facing with an extension resting against the middle lingual third of the left central incisor. On the right side, there was a three-quarter gold crown carrying a Steele facing.

The dentist is always given an opportunity to prepare abutment teeth before the orthodontic case is completed. The dentist completes the bridges for insertion, while the orthodontist retains the case. A plate with or without teeth is used for the purpose, although a lingual appliance is often used for retention.

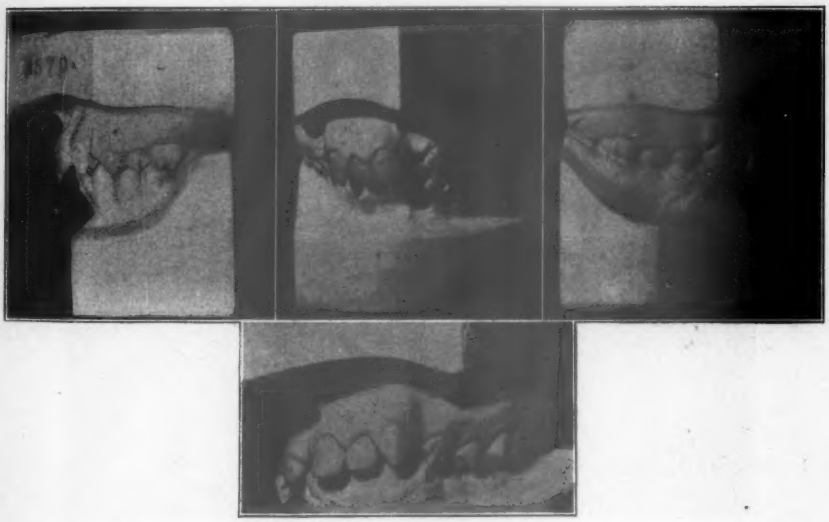

Fig. 3.—Above, case before treatment. Below, another view of the right side; showing overbite. The maxillary teeth bite on the buccal aspect of the mandibular teeth.

Case B. Collapse of the entire denture was due to the loss of the maxillary left central incisor, through accident, and the mandibular left first molar, through extraction. Owing to the shifting and

tilting of teeth and the stress and strain of occlusion, the lingual surfaces of the maxillary right premolars and molars occluded with the buccal surfaces of the mandibular right premolars and molars. All maxillary teeth had shifted toward the median line, the loss of the mandibular left first molar contributing to the condition. In addition, there was closure of the bite anteriorly so that a prosthetic restoration could not easily be made.

The dentist and orthodontist agreed that the bite must be raised. The orthodontist proposed to accomplish this by bringing the posterior teeth into articulation. The plan was to effect functional efficiency while sacrificing ideal occlusion.

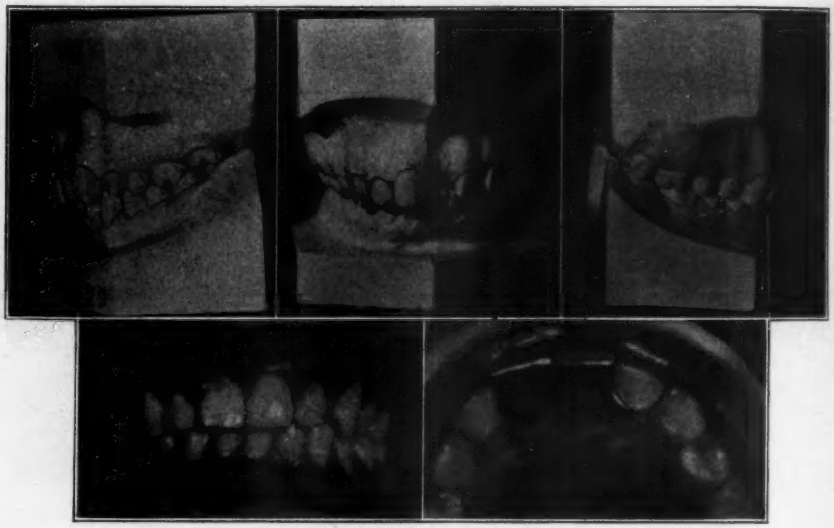

Fig. 4.—Above, case after treatment, showing correction of overbite. Below, frontal and lingual view of prosthesis.

All upper and lower teeth were banded with Angle edgewise arch bracket bands. The molars carried 0.022 by 0.028 inch buccal tubes and half-round tubes on the lingual surfaces of the bands to maintain a continuous lingual arch band. The upper lingual arch had finger springs to move the maxillary left lateral incisor away from the maxillary right central incisor. The mandibular lingual arch had a recurved lingual auxiliary spring on the lower right side to aid in the movement of the premolars buccally. The half-round attachment to the mandibular right first molar was used to move the mandibular molar buccally. To aid further in this movement, hooks suitable for attachment of small elastics were added to the lingual surfaces of the mandibular right first and second premolars, the upper right side of the labial arch, lingually on the mandibular first molar and buccally on the maxillary first molar. By torsion on the arches and by means of elastics from the buccal aspect on the maxillae to the lingual aspect on the mandible, the maxillary teeth were moved lingually and the mandibular teeth buccally until they occluded. The loss of the mandibular left first molar had caused tilting of the second molar forward. This tooth, when tilted backward and then moved forward along a

labial and lingual trolley, was brought against the mandibular left second premolar. The trolley is constructed as follows: A half-round wire is soldered to a tube having a 0.036 inch lumen. The lingual arch wire has a stop soldered at a point one-half inch forward from its entrance to the mesial end of the tube. A half-round wire fits into the half-round tube soldered on the lingual surface of the band on the second molar. First, the trolley by traction to a position adjacent to the second bicuspid. This movement is aided by a similar ligature buccally. The closure of the space had obviated placement of a bridge.

The only prosthesis used to complete this case, an anterior bridge, was constructed by using the upper right incisor with a gold Carmichael crown as an abutment, carrying a Steele facing to replace the upper left central incisor. A

Fig. 5.—Above, case at time of accident. Center, before treatment. Below, case after treatment and prosthesis.

second molar is righted by use of the usual lingual arch, which has a half-round wire soldered to it. After the tooth is righted, the appliance is altered on the side for the attachment of the trolley. A ligature is tied behind the half-round attachment to the stop, moving the second molar bodily forward along the gold lug rested against the lingual aspect of the upper left lateral incisor.

Case C. The patient wanted the case completed as quickly as possible to have a favorable cosmetic result. The case is described because, when it was first seen, a complete orthodontic procedure might have been instituted. After many years,

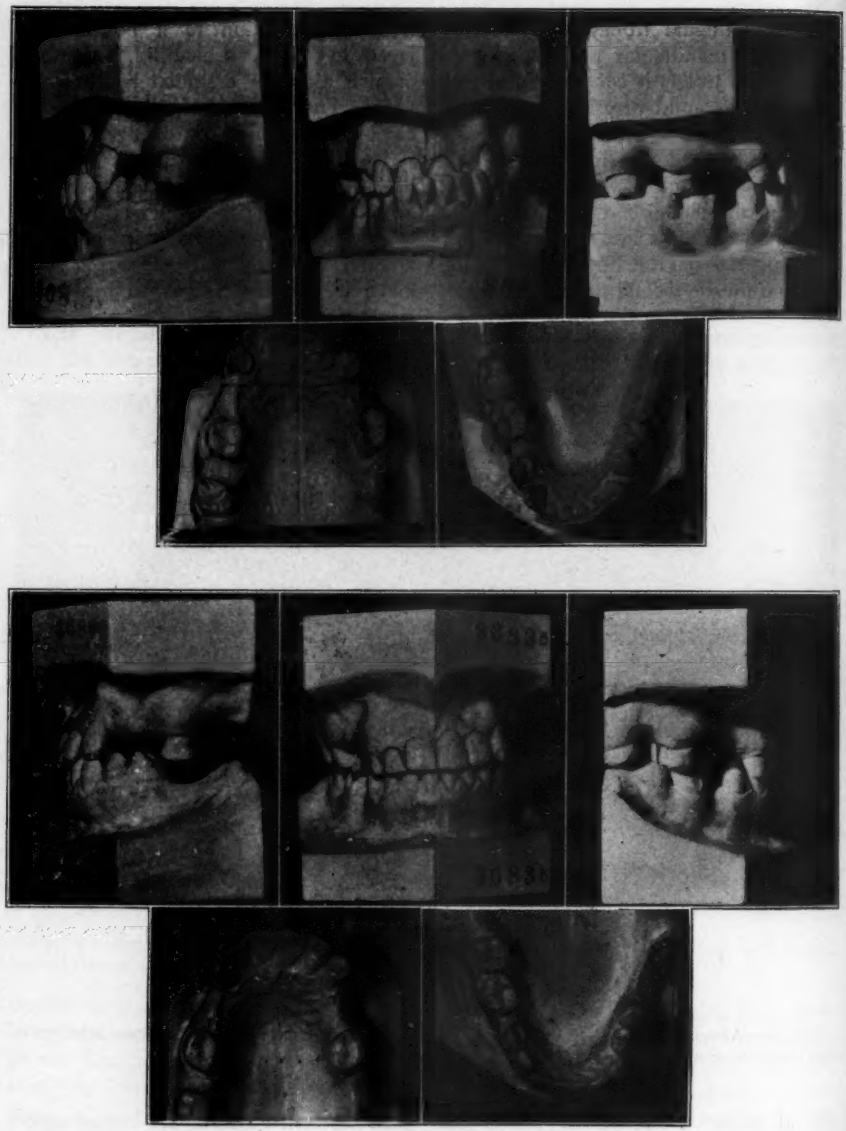

Fig. 6.—Above, case before orthodontic treatment. Below, case after treatment; showing movement of anterior maxillary teeth, closure of spaces in mandible and tilting lingually of mandibular incisors.

in young adult life, the case was handled to suit the patient to achieve an esthetic result.

The maxillary left central incisor had been lost through accident in childhood. No dentist was consulted. The maxillary

left lateral incisor, which had moved mesially to contact the maxillary right central incisor, was moved distally during treatment to make sufficient room for the placement of a porcelain jacket crown to approximate the size and shape of the natural right central incisor. The maxillary right lateral incisor, which was partially destroyed by caries, was moved distally for the reception of another porcelain jacket crown. Rotation was accomplished. The appliance used was a continuous 0.036 inch lingual arch with finger springs and stops against the canines in conjunction with a labial arch. The result is pleasing to the patient and the orthodontic interference was helpful to the dentist in his work.

Case D. This case would be classified as a Class III (Angle), although, owing to the multiple loss of teeth in the mandible and maxillae, diagnosis was difficult if Angle's classification was to be the guide. Gnathostatic diagnosis showed it to be a case of bimaxillary protrusion, both mandible and maxillae being an-

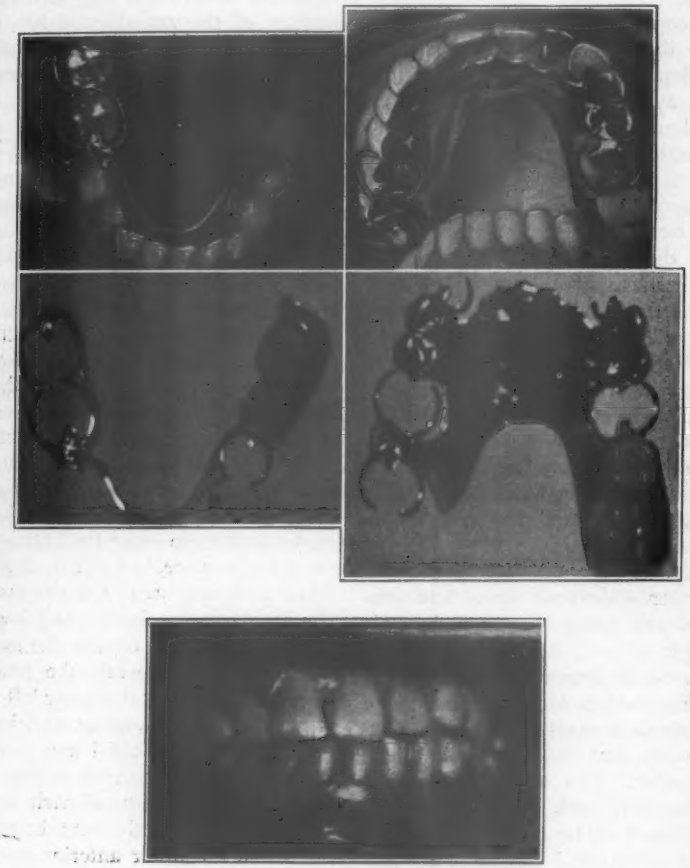

Fig. 7.—Above, prosthesis. Below, anterior view after completion.

terior to their accepted relationship to the skull. The casts were oriented on an eye-ear plane. (Frankfort horizontal plane.*) Since the mandible was anterior to the upper denture, the case was classified as a bimaxillary protraction. The lower six anterior teeth had been forced still farther forward by the stress of occlusion.

A compromise plan was evolved whereby the upper anterior teeth were to be depressed in their sockets and lifted away from their position of rest on the lingual aspect of the lower anterior teeth. In this process, the upper anterior teeth were to be rounded out. Simultaneously, the lower anterior teeth were to be tilted lingually and retracted so that they would occlude with the lingual surfaces of the upper anterior teeth. As the condition was aggravated by the multiple loss of teeth in both maxillae and mandible, the problem of anchorage was seriously complicated. Special anchorage had to be devised. The molar on the upper left side had grown down toward the mandible and, because it had no opposition, presented another difficulty in prosthetic reconstruction. The general plan was to arrange all other teeth in such a manner as to permit the construction of dentures for use and comfort and still present a good cosmetic effect.

Molar bands were constructed for the upper first molars for the reception of a continuous lingual arch using half-round tubes and 0.022 by 0.028 inch buccal tubes. The six anterior teeth were banded with Angle edgewise bracket bands. The continuous lingual arch was constructed with stops mesially from the molars and distally from the cuspids, with two finger springs anteriorly, one to press upward and against the upper central incisors and another to move the maxillary left lateral incisor upward. On the mandible, the right molar was banded, and, on the left side, owing to the loss of the molars, both the first and second premolars were banded together and soldered for use as anchorage. Half-round tubes were soldered on the lingual surface of the mandibular right first molar band and on the lingual surface of the mandibular left second premolar band. A 0.022 by 0.028 inch tube was soldered on the buccal surface of the right molar band and a similar sized tube was soldered on the buccal surfaces of the first and second left premolar bands. A continuous 0.036 inch lingual appliance was constructed, resting against the right premolar and the mandibular right canine, and away from all other anterior teeth, and also resting against the mandibular left first premolar and anchored in the half-round tube soldered to the lingual surface of the left second premolar band and the right molar band. This appliance had stops mesially from the mandibular right molar anchorage and distally from the mandibular left first premolar. As the general plan was to depress the maxillary left molar anchorage while the anterior teeth were set in place, a 0.022 by 0.028 inch labial arch was used. On the mandible, the plan was to shorten the lower anterior segment and depress the teeth and tilt them labially while the space was closed distally from the lower left canine. Because of the movement anticipated, a 0.022 inch round labial arch was used. Because of the expansive quality in the maxillary 0.022 by 0.028 inch arch, the upper anterior teeth were being tilted out while the lower anterior teeth were being depressed in their sockets. Interference was eliminated by the opposite effect in the mandible, shortening the arch. The upper lingual appliance was depressing the maxillary left molar in its socket. The lingual appliances were helpful in maintaining the anchorages in their relative positions.

*SIMON, P. W.: Fundamental Principles of Systematic Diagnosis of Dental Anomalies. Boston: The Stratford Co., 1926. (Translated by B. E. Lischer.)

No effort was made to obtain rotation of the mandibular left first and second premolars because it was believed that, during treatment, it was better to maintain the anchorage than risk a subsequent shift of those teeth. Although vulcanite retainers were employed pending construction of a prosthesis, the case was self retaining.

The prosthetic appliances inserted were constructed as follows: Maxillary and mandibular vitallium partial dentures were constructed with vitallium clasps. The upper was a horseshoe denture with a half clasp engaging the left canine and a labiolingual clasp around the molar, and an occlusal rest having two Steele facings with a carved metal occlusal surface between them. On the other side, there was a lingual clasp on the right canine and a labiolingual clasp with a rest on the occlusal surface of the right molar also having two Steele facings with carved metal cusps between them.

The mandibular denture lingual bar plate had a labiolingual clasp and a modified Roach clasp engaging the first and second premolars, respectively, with a rest on the distal surface of the second premolar and a saddle replacing the teeth distally from these teeth. The right side was held in place by buccolingual clasps on the first and second molars with an occlusal rest on the mesial and on the occlusal surfaces. A small all metal dummy replaced the lower right second premolar, with an occlusal rest on the lower left first premolar. The case as constructed balanced well and there was no wear visible on close and periodic inspection.

This case is not presented for the result achieved, but only to show that care and study prior to treatment eased subsequent treatment and results were satisfactory when full cooperation was given to the dentist.

CONCLUSIONS

1. Much good can result from consultation between the dentist and the orthodontist.

2. Cases in which teeth are congenitally missing or have been lost through extraction lend themselves to cooperative effort.

3. The orthodontist must show the dentist that carefully planned orthodontic diagnosis is an adjunct in planning mouth rehabilitation and preventing mouth debilitation.

4. Orthodontic treatment, if instituted early enough, may prevent debilitation.

5. Simple orthodontic procedures can be more helpful than complicated treatment if the case is treated at the proper time.

6. It is important to know when to avoid prosthesis and when to employ it.

7. It is equally important to know when to avoid orthodontic treatment and when it should be given.

8. Some cases lend themselves to bite raising by orthodontic procedure in that raising the bite by the use of inlays might injure the supporting tissue of the teeth and the temporomandibular joint.

9. There is no need to create an ideal occlusion, although it is desirable, but the patient must be given a functional bite.

10. Reports of cases showing cooperation between the dentist and the orthodontist would lead to further study and be beneficial to more patients.

332 New York Avenue.

GRAPHIC INTERPRETATION OF THE STRUCTURES INFLUENCING MANDIBULAR DENTURE MUCOPERIPHERAL OUTLINE FORM

By ROLAND D. FISHER,* D.D.S., Glendale, Calif.

THE daily demands made upon the dentist in general practice are broad in scope, but narrow and precise in the requirements of execution. Never a day goes by that we are not called upon to be surgeon, mechanic, artist, psychologist, diplomat and economist—any one of which is a life study in itself. We must, however, perform the surgical procedures with dexterity to avoid unnecessary injury to the tender tissues, nerves or blood vessels that may be in close proximity to the field of operation. The intricate bridge restoration we must make with the precision of a watchmaker. The color and contour must express the artistry in us. The patient, who too often greets the dentist with the familiar phrase, "I hate to come here," must be made to relinquish his fears and to patiently await the benefits to be acquired from the service rendered. To climax these exacting duties, we must attempt to deliver a quantity and type of restoration within the patient's financial means.

It is small wonder, then, that, with these numerous obligations, we soon find ourselves inclining toward the one or two branches of the work for which we seem particularly fitted. It is natural, since we are called upon to cover such a broad field, that we incline toward the type of work which brings to our daily experience the least distress of mind.

It is for this reason that the field of full-denture construction ranks probably at the bottom of the popularity list in many offices. Often I have heard dentists say, "I don't care if I never see another full denture case." True it is that if we desire to excel as prosthodontists, we must cultivate exceptional skill in surgery, mechanics, art, psychology, diplomacy and economics.

It is only in the densely populated cities that the prosthetic specialist exists, and, even there, the patient will generally prefer to place his confidence in the hands of his own family dentist because it is he who knows how the patient's natural teeth looked.

So every dentist has a few "full dentures" to make as his patients of years' standing lose their last teeth. He does not receive many referred cases. He may not be called upon to construct more than one or two full dentures in a year. With such limited experience, his results can hardly be expected to reflect exceptional skill or even average ability. Herein lies the origin of one of the chronic blotches upon the face of ethical dentistry.

Have you ever heard a dentist say, "I wish that I could have some requests for full dentures after the teeth have been removed and the ridges are smooth. In nearly all my cases, there are a few teeth left, and I have to work with unprepared mouths. I wonder what becomes of my patients when they need another set of teeth?" I have heard this many times, and I am sure that you have too. I be-

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Prepared for the Full Denture Section of the American Dental Association, 1942.

lieve that if those first dentures had evidenced even an average understanding of the problem at hand, the patient would have returned for further service rather than gone elsewhere.

This is why we find so many of our denture patients going hither and yon in search of the answer to their problem, and finally, in desperation, going to the dentist whose extravagant promises are embroidered in transparent bases, months to pay and no interest, the general practioner being unable to convince them that he understood the problem and had the ability to solve it.

The majority of dentists have had teeth filled. We know how sensitive the

Fig. 1.—Basic muscles of face influencing buccal denture outline form.

teeth are when overheated during cavity preparation, how they hurt when cold air is blown on them and how they ache when the pulp has not been properly insulated. We have actually experienced these discomforts, and, when working on our patients, we recall and are able to speak understandingly about them.

Relatively few of us wear full dentures and can understand the problems of the patient from actual experience. We who do not wear dentures, therefore, must study to learn the difficulties attending them and how they may be met.

I shall attempt to deal with only one consideration in full denture construction. It is elementary, but exceedingly important—the foundation outline form of the lower denture.

The denture the outline form of which shows that the dentist understood the anatomic structures determining the limits of extension is an exception.

We should use the reasoning of a structural engineer. When he is consulted regarding building a bridge across a river, he asks to see the site of the piers to determine what sort of foundation he can have. He wants to know what the structure is expected to carry. Will it be a foot or a railroad bridge? He will, I am sure, make a careful study of the

Fig. 2.—Anterior border of masseter muscle emphasized by sucking in cheek.

problem before he quotes a price and, because of the existence of variable conditions, no two of his bridges can ever be the same price.

Why do we not use his reasoning and ask to see the site of the denture bridge —that is what it really is. First, let us examine the foundational area to determine its quantity and quality. Let us determine the muscle tone and estimate how much of a load can be carried. Let us talk with the patient long enough to learn what he is expecting of this denture, and how much cooperation he is capable of giving. Then, and not until

then, are we in a position to estimate what the cost of construction should be. Like the engineer's bridges, no two dentures cost the same amount.

Now let us proceed to interview a prospective patient as we would in our office.

First we greet him, "Good morning, Mr. Blank."

Mr. Blank says, "You see, Doctor, I have no teeth." Then, "What do you charge, Doctor, for a set of teeth?"

A whole story could be written here on patient approach, diagnosis, economics, and the like; but that is for another day.

The patient has decided that we are to be his dentist, and we have decided that we have a place in our practice for him.

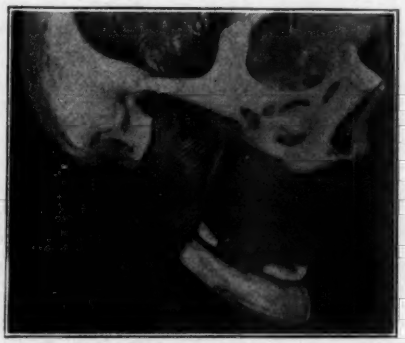

Fig. 3.—Free space or stressbearing area available between distal attachment of buccinator to mandible and anterior border of masseter.

Of course, we have looked into the patient's mouth long before this and have a mental picture of the task before us. If we are not reasonably familiar with the anatomy of the mouth, and in possession of a good mental picture of the available stressbearing areas—please note that I say a mental picture—this case may present some difficulties before it is completed.

A glance into the mouth does not tell much except that the patient has no teeth. To many dentists, already overwhelmed with the great demands of a general practice, this aperture formed by the lips is the entrance to a hall of mystery, giving rise to doubts and fears.

A careful examination reveals that Mr. Blank has a maxillary arch that appears to be, shall we say, normal; that is, it shows no unusual characteristics and, as in the average case, does not seem to offer the obstacles that the mandibular ridge does. The mandibular ridge, however, does not look so encouraging. In fact, another good look will be required to find one.

To add to our dismay, the patient produces numerous examples of previous efforts made to fit him, none of which

Fig. 4.—Anticipated stressbearing area in cuspid region.

has had the effect of increasing his confidence in modern, or rather so-called modern dentistry.

This man is not poor. He has not looked for the cheapest service. But he is not rich. He has traveled far and wide and tried dental service everywhere. One of the dentures that he has was made in London, but it is no better than any of the others, and perhaps no worse.

The denture he has tried to wear for the past seven years is as round and polished on the tissue side as a billiard

ball. It gives evidence of many repairs, which proves that it has been worn considerably. Nevertheless, it is a masterpiece of misunderstanding of the task at hand on the part of the operator.

Rather than be discouraged by the seeming lack of a denture-bearing area, let us enumerate the conditions in our favor, and so start a constructive denture service for Mr. Blank.

Fig. 5.—Stressbearing area on right side of mandible in second molar region.

Fig. 6.—Anticipated denture-bearing area.

First, he has the same anatomic structures for consideration as another patient would; namely, tongue, lips and cheeks. One might ask what structures comprise the lips and cheeks, and what influence they have on the lower denture design. They are the muscles of mastication and the accessory muscles of mastication.

Could we take the superficial tissues from the face and see these muscles, the picture would be very much like Figure 1.

Let us consider the muscles directly concerned with the lower denture outline form. First, the masseter and buccinator muscles are very important. The orbicularis oris and other accessory muscles I shall mention as we go along.

Fig. 7.—Appearance of floor of mouth with tongue pulled violently to left side showing palatoglossus muscle.

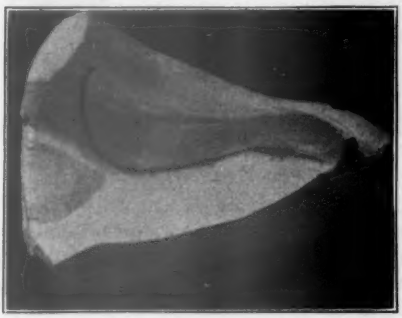

Fig. 8.—Distal extension of lingual flange in relation to posterior border of soft pad.

The masseter muscle originates along the inferior border of the zygomatic arch and passes back and downward, inserting itself into the lateral aspect of the

ramus of the mandible at the angle. A very strong muscle, it is used to close the mouth. In spite of the fact that the patient has very little of the alveolar ridge left, he does have a masseter muscle, as every one has, and it will always be found in the same place, with very slight variations.

To locate it on the face, the patient is asked to suck in the cheeks, since this action distinctly outlines the anterior border of the masseter muscle. (Fig. 2.)

The buccinator muscle originates on the buccal surface of the maxilla, extending from the second bicuspid area to that of the second molar. The fibers run horizontally, inserting themselves distally

Fig. 9.—Primary impression made in mouth and showing influence of masseter and buccinator muscles on buccal outline form.

in the pterygomandibular ligament or raphe. The muscle also attaches itself to the buccal surface of the mandible above the external oblique ridge, extending from the second bicuspid area to that of the second molar, or slightly farther distally. The anterior fibers insert themselves into the orbicularis oris. This muscle, which forms the body of the cheek, is sometimes called the trumpeter muscle. It is very important to the prosthetist.

When the patient sucks in the cheeks —a very common muscular action—the maxillary and mandibular attachments are very pronounced, as is also the anterior border of the masseter muscle. When the two muscles are in position, a free space exists between the anterior border of the masseter muscle and the posterior attachment of the buccinator muscle on the mandible. (Fig. 3.) This creates the buccal pouch, of which we shall take full advantage in outlining the lower denture. This area in which there is no muscle attachment exists in every patient whether old or young, rich or poor.

Now we must examine the accessory

Fig. 10.—Vulcanite impression tray conforming to active limits of peripheral muscles.

muscles in order to find another free space. The triangularis and the quadratus labii inferioris are attached low on the mandible in the bicuspid area. The mentalis is attached near the median line. Between the two, we have an anticipated free space, a stressbearing area. (Fig. 4.) Although it is not so large as the posterior one, it is large enough to be useful.

To avoid discouragement in the case, let us assure ourselves that, while there seems to be no ridge, there must be a remnant of the alveolar process which

originally held the teeth in place. When I say a remnant, I am assuming that we are all familiar with the variable degree of resorption that takes place in the alveolar process. In some instances, owing to cumulative conditions, only a vestige of the original process survives; but no matter how great the resorption has been, there is a foundation area left. (Fig. 5.)

Let us look at the available foundational area. Starting back of the soft pad or the point of insertion of the pterygomandibular raphe, we note the relative position of the masseter muscle. We can also determine the available stressbearing area between its anterior

Fig. 11.—Finished denture outline. This will be very similar to the tray outline except that now the periphery has been formed by the actual movement of the muscles against the impression material used in the tray.

border and the posterior attachment of the buccinator muscle. Let us note also how the stressbearing area narrows to permit the action of the buccinator muscle, and the slight increase that there is in the stressbearing area of the cuspid region. (Fig. 6.)

Let us look at the lingual side and analyze it as we have the buccal aspect. It is a difficult area to examine because of the bulkiness of the average tongue. If we have the patient pull the tongue vigorously to one side, we can see the floor of the mouth, as in Figure 7.

Distally, where it is difficult to see in the mouth, we note a muscle inserted into the side of the tongue. It extends laterally, sending a few fibers into the soft pad, and then passes up and backward into the soft palate. It determines the distolingual extension of the denture, which is, of course, very important in that we are desirous of obtaining all the lateral throat form retention possible. We are equally anxious to avoid overextension, with its discomfort to the patient and consequent loss of time in

Fig. 12.—Broad stressbearing area in molar region; tapering toward soft pad posteriorly produced by action of anterior border of masseter; narrowing in bicuspid region produced by buccinator muscle and slightly larger stressbearing area in cuspid region.

denture adjustments on the part of the dentists.

An arbitrary rule for the distal extension of the lingual flange will be found useful in outlining the primary cast for the tray: Do not extend the distal lingual border farther than the posterior portion of the soft pad. A line drawn perpendicularly to the posterior border of

the soft pad will be found to be just about as far back as can be tolerated. (Fig. 8.)

The muscle on the opposite side from the corner of the mouth into which the tongue is placed is the one being extended. In other words, the patient places the tongue in the corner of the mouth on the right side to determine the distal extension on the left side.

When the tongue is brought back to a comparatively normal position, the muscle becomes slack. It is only extended when the patient puts the tongue in the corner of the mouth; or in the vestibules of the cheeks, which, of course, happens many times a day. A knowledge of this muscle and its action is therefore very important.

Now in considering the lingual periphery, let us divide the region into three areas: from the distal angle to the region of the cuspid, area one; from the cuspid on one side to the cuspid on the other side, area two, and to the distal angle on the other side, area three.

It must be remembered that a fundamental rule in denture retention is that the periphery of the denture must extend onto placeable or soft tissue in order to secure a seal. This lingual flange of the denture must be deep enough. It must pass below the mylohyoid ridge until it forms a perfect seal at the floor of the mouth. To determine this depth, the patient is asked to carry the tip of the tongue under the upper lip and into the cheek vestibules as if to remove food from them, also to extend the tongue into the mandibular cheek vestibules and then moisten the lips.

It is the action of the tongue that determines the rise and fall of the floor of the mouth. Therefore, the tongue is the

Fig. 13.—Dentures made for same mouth. The old denture evidences no knowledge of the stressbearing area available or of the muscles bounding it.

Fig. 14.—Another view of dentures shown in Figure 13. The patient wore the new dentures with complete satisfaction.

best means of determining the length of the lower border of the denture. Any impression material that remains soft while the tongue makes these movements will afford a perfect peripheral seal.

The depth of the lingual flange in area one, let us say, on the left side is established by extending the tray, impression or denture, whichever the case may be, down to the fioor of the mouth just as far as possible without restricting the tongue in its attempts to clean the cheek vestibules. If the extension is too deep, the tongue movements will raise

Fig. 15.—Another denture showing typical foundation outline form, wide in molar region, narrow in bicuspid area and with a slight increase again in cuspid area.

the denture. If it is too short, the denture will lack a valve seal and be loose. Attempts to take impressions or determine boundaries with the mouth wide open will result in false records. The patient should keep the mouth closed in as nearly a "normal resting position" as working conditions permit. Areas two and three are, of course, determined in the same manner as area one.

It is not my intention to deal with impression making, but foundation areas and how to determine them is such an integral part of making the impression that there is bound to be an overlapping.

Let me "debunk" the impression tray "bunk." We have been going through an epidemic of "impression trayitis"—trying to put intelligence into non-intelligent metal. Don't be misled: An impression tray can only produce an impression that reflects the understanding of the individual using it. It does not matter how much you pay for it. Any stock tray, provided it is large enough, will do.

A generous quantity of compound should be used, as in Figure 9. This is an actual primary impression taken from a patient. The influence of the masseter and buccinator muscles and the wide stressbearing area in the molar region are to be noted.

This type of impression should make a tray similar to that in Figure 10. This, of course, only shows one half of the tray. The handle is there for convenience. The finished denture bears a similar outline, as in Figure 11.

In the case of the patient under discussion, Figure 12 shows the cast poured from the final impression. The influence of the muscles on its peripheral outline is evident. The finished denture in comparison with the denture worn for seven years is shown in Figure 13. Figure 14 is another view.

The characteristic outline form for the lower denture, as shown in Figure 15, will prevail unless surgical measures or pathologic conditions interfere, and in spite of the degree of alveolar resorption that may take place.

DENTISTRY IN NEUROPSYCHIATRY

THE SIGNIFICANCE OF ORAL SEPSIS AND COSMETIC DEFECTS

By Richard DeMonbrun Kepner,* M.D., F.A.C.P., and King Tan Chock,† D.D.S.,
Kaneohe, Oahu, Hawaii

IN this paper, an attempt is made to evaluate the rôle of dentistry in the prevention and treatment of neurologic and psychiatric disorders. The subject is discussed from the angle of oral sepsis and focal infections, and from the angle of cosmetic defects and their concomitant emotional reactions.

The Cumulative Index Medicus 1930-1942 listed only a few articles on the relationship between dentistry and psychiatry, most of them in foreign journals, although articles were listed dealing with the relationship of dentistry to all other kinds of disorders.

There is no question that the dental surgeon has a very important rôle in neuropsychiatry. However, there has been and still is much misconception on the part of both physicians and dentists as to just what that rôle is. Much of the present confusion originated with the physicians themselves, but the dentists have perpetuated it.

It would seem to be about time to challenge some of the inherited fallacious statements in the textbooks and in the literature. Mead,[1] in 1940, still attributed a wide variety of disorders to focal or metastatic infection. He writes:

> Among the mental disorders attributed to mouth infections are malaise, early fatigue, neuritis, neurasthenia, frontal vertical and occipital headaches, painful spine, insanity, paralysis, herpes zoster, psychoses due to debilitating anemia as a result of long standing absorption. Mental disturbances are often due to infected and impacted teeth, especially mental depressions. Favorable results may be expected by removal of oral sepsis in cases of slight mental derangements. My experience with the more severe types of mental cases has been that the removal of oral sepsis has not brought about recovery.

Anderson,[2] in 1942, wrote:

> Numerous neurologic and psychiatric states have sometimes been related to dental states: meningitis, encephalitis, myelitis, brain abscess, herpes zoster, anterior poliomyelitis, multiple sclerosis, neuritides, convulsions, dysphagia, hysteria, and occasional neuroses and psychoses.

While numerous ills in addition to the foregoing, such is iritis, optic neuritis, arthritis, endocarditis, nephritis, myocarditis, gastric ulcer, cholecystitis and appendicitis, have been blamed on focal infections,[3] the association of infected teeth or tonsils with metastatic infection is seldom based on sound evidence.[4, 5, 6]

Following Rosenow in his ideas on focal infection and on the specificity of the streptococcus, every one—physicians, dentists and the public alike—went wild and removed harmless teeth, tonsils, appendixes, gallbladders, colons, etc., and prepared allegedly autogenous vaccines from them to treat neuritis, neuralgia, arthritis and even psychoses, not to mention all other possible human ailments. At the present time, it seems well established that Rosenow's ideas were wrong —that focal infection is not the source of

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Read before the clinical meeting of December 1, 1942, of the staffs of the Territorial Hospital and of the Kaneohe General Hospital, U. S. Army.

all ills,[7] that the organisms are not specific[4] and that the vaccines are not autogenous.[4] Enough work has been done by authorities to show fairly conclusively that his work was not valid.

Arthritis is, of course, one of the chief conditions alleged to be caused by dental infection. At the present time, it is believed by many workers that there is little, if any, evidence that focal infection has anything whatsoever to do with arthritis, cause or cure.[4, 6]

Neuritis, including optic neuritis, is another condition ascribed to oral infection. Now many authorities believe that the rôle of focal infection is so negligible as to be considered of no consequence.[5, 8] Bacterial neuritis is extremely rare[9, 10] and almost never occurs except by secondary invasion of fibers from areas of suppuration in the soft parts.[10] The clinical data concerning the relation of chronic infection and neuritic pain vary with the therapeutic enthusiasm of the clinician.[10]

Neuralgia is also attributed to focal infection. Again, there is no convincing evidence that this is so. Unquestionably, caries, infected or impacted teeth and gum and alveolar infection may infrequently cause a so-called "reflex neuralgia"; that is, pain referred along the course of a nerve.[11] This, however, is not a toxic or an infectious process in the nerve, and, in these cases, one must be sure that the pain is not of psychogenic[5, 11] or trigeminal[2, 5] origin.

General ill health, malaise and neurasthenia have all been blamed on focal infection. The evidence is not convincing. Without doubt, many patients with these conditions are under par physically, and some do improve when oral infection is cleared up and other measures are taken to improve the general health. Yet when one contemplates the vast number of persons whose mouths show pyorrhea pockets, apical abscesses, etc., and who are nevertheless in excellent health, it seems well to ponder a bit on the amount of damage these conditions cause.

Other infectious and degenerative diseases of the nervous system have been ascribed to focal infection. However, there were reported,[12] in a series of 15,000 necropsies, only two cases of metastatic abscess of the brain, two cases of cavernous sinus thrombosis and one case of subdural abscess due to dental infection. No other infections of the nervous system secondary to oral sepsis were reported in this series. The plain facts seem to be that oral infection does not ordinarily cause metastatic infection unless an overly vigorous curettement, etc., has broken down Nature's pyogenic membrane and opened the blood vessels, permitting a bacteremia.[10] Even then, the incidence is surprisingly small. Brain infection is, of course, known to occur from general sepsis, malignant endocarditis, pulmonary infection and pyemic states,[10] but these are not due to oral sepsis. Optic neuritis, multiple sclerosis, trigeminal and glossopharyngeal neuralgia, Ménière's disease and spasmodic torticollis are other conditions wrongly ascribed to focal infection, but not relieved by elimination of the infection.[5] The other neurologic conditions listed above[1, 2]—meningitis, encephalitis, myelitis, anterior poliomyelitis, herpes zoster, convulsions and paralysis—are not mentioned in recent neurology texts as due to oral infection,[13, 14, 15, 16, 17, 18, 19] The only exception was one case of transverse myelitis, with recovery, and which was ascribed to dental caries.[20]

Psychoses have been attributed to focal infections, but this theory is no longer generally accepted by most, although, of course, the psychotic manifestations of certain toxic and febrile reactions, such as pneumonia and typhoid fever, are well-known.

One of the most heroic attacks on mental disorders was that made by Cotton,[21] who removed the colon from many patients suffering from dementia praecox to obviate the absorption of products from the bowel. Fortunately this is no longer done, although other

disease areas are considered foci for some.

More recently, a rather impressive-looking report was published[22] in which the astounding hypothesis was advanced that schizophrenia or dementia praecox is a toxic infectious disease of the central nervous system from a focus of infection, notably in the teeth and tonsils. In this series, treatment consisted of the injection of allegedly autogenous vaccines made from cultures of tonsils or of teeth, or both, with remissions in a certain percentage of cases, but also with relapses.

Graves,[3] of Birmingham, reported that 85 per cent of his mentally ill patients suffered from dental or sinus infections, and there was a remission of 54 per cent when foci of infection were eliminated. Interestingly enough, Henry[24] reported that he had not had a single case in which removal of septic teeth alone cured the condition, and he wondered whether the vaccine was the secret. In addition, he used intestinal antiseptics in his cases.

Of course, the fallacies in all this are obvious. In the first place, there is no neuropathologic evidence of any toxic or infectious changes in the nervous system in dementia praecox cases, or, for that matter, in manic-depressive cases,[25, 26] which make up about one third of all mental disorders. Second, the vaccines used were not autogenous. If so, they should have been obtained from the brain, the part alleged to be infected. Third, recent experiments with nonspecific vaccines and other forms of shock therapy have had good or better results than the foregoing. Fourth, the removal of potential foci may possibly have improved the general health in some instances and so contributed to improvement of the mental health. But it is probable that the personal attention and interest shown these patients was much more important than any of the foregoing as regards beneficial results.[27, 28] One must be careful to avoid the age-old fallacy *post hoc, ergo propter hoc;* that is, it does not necessarily follow that improvement after elimination of local infection resulted because of its elimination.

Now all of the foregoing is not intended to suggest that foci of infection, dental or otherwise, should not be eliminated. As a matter of fact, all foci of infection, no matter where situated, should be eliminated whenever practicable and not contraindicated regardless of whether there exists any suspicion of metastatic infection. But—and this is important—no miraculous effects should be expected in the way of curing neuropsychiatric disorders or, for that matter, most other ailments.

Without question, every attempt should be made to prevent dental infection and caries, and this care should begin with prenatal care, care at birth and from birth on, proper diet, with sufficient calcium, phosphorus and vitamins, ultraviolet therapy, etc. However, in view of the present state of knowledge and the many conflicting theories concerning the causes of dental infection and caries, it is sometimes as difficult to advise on prevention as to attempt a cure. Much has been said about cleaning teeth—"a clean tooth never decays"—yet some tooth erosion and decay can be traced to too vigorous cleaning.

Much has been said about alkaline-ash diet, with much disagreement. The reaction of the saliva, the retention of food, especially carbohydrates, with resultant decay, the presence of *Lactobacillus acidophilus,* regurgitation of acid gastric juice—all have been implicated without a general agreement among dentists as to the importance of each.

The causes of pyorrhea alveolaris or periodontoclasia are not clearly understood. The fusiform bacillus and the spirillum of Vincent are thought by some to cause this condition, by others merely to be secondary invaders in already damaged tissue.

Vitamin C is very popular now in the treatment of gingivitis, because of the known gingivitis due to lack of C, in scurvy for example. Yet many cases of

gingivitis have developed on a diet adequate in vitamin C, and have not responded to administration of more C, although, in some instances, benefits have been reported.

Malocclusion, absence of opposing teeth, etc., have been blamed, as has use of a soft diet which does not give the gums the exercise they need. On the other hand, the mastication of rough foods also has been blamed. So the remedy is still somewhat obscure.

Therefore, in the light of present knowledge, such preventive and remedial measures as are available must be applied. It must not be forgotten that the condition of the teeth and gums may be a reflection of the general health, and the dentist must be ever alert to recognize in the mouth signs of systemic disorders,[7] such as anemia (pallor), pernicious anemia (glossitis), deficiency in calcium (poor tooth structure), deficiency in vitamin C (gingivitis), malignancy (leukoplakia and ulcers), syphilis (patches and other lesions), tabes (loose teeth[9]), acromegaly from pituitary disease (abnormal separation of the teeth), trigeminal or psychogenic neuralgia (atypical pains without dental findings), etc. In this way, by collaboration with or referal to physicians, dentists may be of invaluable aid in recognizing and correcting systemic or local disorders which may undermine the general health and so assist in paving the way for mental disorders in predisposed persons.

Nor must the work of the dentist end there. The cosmetic appearance—that which appeals to the vanity of women and to the self-consciousness of men—must not be overlooked. We all know that while some people are apparently not much worried by their unpleasing appearance and defects and deformities, most persons are. Anything that induces a feeling of inferiority may cause embarrassment and shame, which, in turn, may lead to withdrawal from society and from normal associations, with resultant mental illness, major or minor. It is our impression that this function of the dentist is as important in neuropsychiatry as is treatment of oral infections.

Carious and missing teeth, unsightly dentures and even halitosis undoubtedly have profound effects on the emotional life of many persons.

Every one has seen children who are ashamed of their appearance because the front teeth are out, or the teeth dirty, discolored or decayed. These children hide their faces, covering their mouths with the hands in obvious embarrassment, talking with the lips together, avoid smiling and stay away from the group. These tendencies are exaggerated when others poke fun at them and ridicule them.

This is not limited to children. Women not infrequently refuse to go anywhere or see friends after extraction of the central incisors, remaining secluded until the teeth have been replaced; retain abscessed teeth, and submit to operations such as apicoectomies because they are afraid a false tooth would be conspicuous. Many will not submit to the ordinary replacements because gold on clasps shows, etc. Even responsible men have been known to shun society and stay away from jobs and remain in their rooms after extraction of teeth until their dentures have been completed, and to stay away from gatherings because they could not eat certain foods with their dentures or their dentures looked artificial.

Other defects, such as buck teeth, crooked teeth, deformities of the jaw, harelip, cleft-palate and unsightly scars, are frequently sources of embarassment and should be corrected by the dental surgeon in collaboration with a plastic surgeon when necessary.

In this connection, it should be remembered that it is not so much what the physician or dentist believes should be corrected, as what the patient feels should be changed. And it is worth the time and effort to make things look as the patient wants them to, even though

the wishes are considered to be based on vanity and even to be a bit frivolous. The time and energy spent in these corrections will be more than repaid in the patient's improved outlook on life.[29]

SUMMARY

1. The rôle of the dentist is an important one in neuropsychiatric cases.

2. Oral infection has been vastly overrated as a cause of psychiatric and neurologic disease.

3. Foci, regardless of where situated, should be eliminated when possible in order to improve the general health and consequently the mental health and whether in neuropsychiatric cases or in other types of disorders.

4. All possible attention should be paid to having teeth clean, straight and in good repair, and the mouth free from infection, for cosmetic and psychic reasons as well as from the toxic-infectious point of view.

5. In neuropsychiatry, reparative dentistry for cosmetic reasons is as important as, or perhaps more so than, the elimination of oral infections in the majority of cases.

BIBLIOGRAPHY

1. MEAD, S. V.: Diseases of Mouth. Ed. 5. St. Louis: C. V. Mosby Co., 1940, p. 1012.

2. ANDERSON, G. C.: Dental and Oral Basis of Certain Neuropsychiatric States. *Dis. Nervous Sys.*, 2:152, May 1941; abstr. Yearbook of Dentistry, Chicago: Yearbook Publishers, 1941, p. 76.

3. STEVENS, A. A.: Practice of Medicine. Ed. 3. Philadelphia: W. B. Saunders Company, 1932, p. 142.

4. KINSELLA, R. A., in MUSSER, J. H.: Internal Medicine: Theory and Practice. Ed. 3. Philadelphia: Lea & Febiger, 1938, p. 132.

5. DANDY, W. E.: Relationship of Dentistry to Certain Neurologic Diseases, *Proc. C. Centenary Celebration*, 1940, p. 140; abstr. Yearbook of Dentistry. Chicago: Yearbook Publishers, 1940, p. 84.

6. COMROE, B. I.: Rôle of Dentist in Arthritis. J.A.D.A., 27:1209, August 1940; abstr. Yearbook of Dentistry. Chicago: Yearbook Publishers, 1940, p. 84.

7. ALLEN, E. V.: Relationship of Medicine to Dentistry. J.A.D.A., 23:254, February 1936.

8. BING, ROBERT, and HAYMAKER, WEBB: Textbook of Neurology. Ed. 5. St. Louis: C. V. Mosby Co., 1939, p. 7.

9. CAMP, C. D.: Neurologic Conditions and Teeth. *J. Michigan D. Soc.*, 21:119, May 1939; abstr. Yearbook of Neurology, Psychiatry and Endocrinology. Chicago: Yearbook Publishers, 1939, p. 77.

10. GRINKER, R. R.: Neurology. Ed. 2. Springfield, Ill.: C. C. Thomas, 1937, p. 635.

11. REESE, H. H.: Editorial discussion of Camp, reference 9.

12. COURVILLE, C. B.: Pathology of Central Nervous System. Mountain View: Pacific Publishing Association, 1937, pp. 105, 113, 137.

13. Reference 8, pp. 287, 384, 404, 516, 686, 707.

14. Reference 10, pp. 331, 632, 684, 691, 699, 727, 831.

15. Reference 12, pp. 80, 82, 116, 166, 174, 176, 177.

16. HASSIN, G. B.: Histopathology of Peripheral and Central Nervous Systems. Ed. 2. New York: Paul B. Hoeber, Inc., 1940, pp. 83, 92, 93, 97, 137, 225, 421, 502.

17. FREEMAN, WALTER: Neuropathology. Philadelphia: W. B. Saunders Co., 1933, pp. 84, 116, 128, 140, 163, 264.

18. WECHSLER, I. S.: Textbook of Clinical Neurology. Ed. 3. Philadelphia: W. B. Saunders Co., 1935, pp. 119, 127, 255, 379, 401.

19. NIELSEN, J. M.: Textbook of Clinical Neurology. New York: Paul B. Hoeber, Inc., 1941, pp. 54, 128, 214, 358, 386, 489.

20. Reference 19, p. 86.

21. STRECKER, E. A., and EBAUGH, F. G.: Practical Clinical Psychiatry for Students and Practitioners. Ed. 4. Philadelphia: P. Blakiston's Sons & Co., Inc., 1935, p. 357.

22. GIBIER-RAMBAUD, GEORGE: Focal Infection in Mental Disorders. *D. Mag. & Oral Topics*, 51:683, July 1934.

23. GRAVES, T. C., cited by Gibier-Rambaud, reference 22.

24. HENRY, in discussion of Gibier-Rambaud, reference 22.

25. Reference 16, p. 502.

26. Reference 17, p. 256.

27. Reference 18, p. 732.

28. DIETHELM, OSKAR: Treatment in Psychiatry. New York: Macmillan Company, 1936, p. 220.

29. BLAIR, V. P.: Plastic Surgery of Head, Face and Neck: Psychic Reactions. J.A.D.A., 23:236, February 1936.

COMPLICATIONS ATTENDING AND FOLLOWING NITROUS OXIDE-OXYGEN ANESTHESIA: CAUSE AND EFFECT

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DURING induction and maintenance, nitrous oxide anesthesia is pleasant and is comparatively free from vomiting and excessive salivation. The induction period is short and recovery is speedy with little or no deleterious effects on any of the vital organs of the body. Certain complications may arise during the administration of any anesthetic, but these complications can, to a great extent, be eliminated by a knowledge of the fundamentals of anesthesia.

Since nitrous oxide washes the oxygen out of the body very rapidly, it is necessary to administer the two gases in suitable proportions in any anesthesia lasting more than one minute, in order to sustain life. With the addition of oxygen to the nitrous oxide, narcosis may be maintained for hours if necessary.

The depth of anesthesia is directly controlled by regulating the percentage of oxygen added to the nitrous oxide, provided the quantity of those gases administered is sufficient to satisfy the respiratory requirement of the patient. There is no fixed mixture of these gases that is capable of producing satisfactory anesthesia in all cases. The mixture required varies with each individual and may vary in the same individual at different times of administration. The percentage of the gases should be regulated by the reactions of the patient.

A free and unobstructed airway is imperative. Any obstruction to the air passages, whether pathologic or mechanical, may restrict the ventilation of the lungs and lead to asphyxia by diminishing the intake of the gas and oxygen, even when an adequate supply is offered by the apparatus.

The internal nasal passages may be obstructed by septal spurs, nasal growths, enlarged turbinates and adenoids. The oropharynx may be obstructed by enlarged tonsils, tumors and retropharyngeal abscesses or by cellulitis. All of these conditions may embarrass the respiration and interfere with anesthesia.

A slight depression of the chin may cut the respiratory volume in half. Pressure of the fingers upon the tongue, forcing its base against the posterior pharyngeal wall, or of a mouth pack improperly placed can so obstruct respiration as to interfere to the danger point with the gaseous exchange in the lungs. Prolonged obstruction, even if only partial, can lead to severe anoxemia.

In organic disorders and obstructions, when the disturbing element cannot immediately be corrected, the airway may be maintained by conveying the anesthetic beyond the impediment by adequate pressure and by the use of nasal catheters.

Adequate precautions can easily eliminate the purely mechanical obstructions.

NAUSEA

Nausea can be avoided by preventing the passage of blood and mucus into the stomach, by aspirating, or sponging, the postnasal drippings from the pharynx, by withholding food for at least three hours prior to induction and by maintaining a

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smooth, light anesthesia. There are some patients, however, who become nauseated in spite of all precautions. If iced tea with ample sugar is taken three hours prior to administration, persistent nausea may be checked. Other anti-emetics are chlorobutanol, a 5 grain capsule with water, or 6 drops of adrenalin in a little water. The main danger from nausea is the aspiration of vomitus and resultant asphyxia and lung complications.

In prolonged gas-oxygen administrations, the patient should be prepared in advance, with a mild laxative the night before, a light evening meal and no breakfast.

Although nitrous oxide is the safest anesthetic in the hands of a competent anesthetist, certain cases are complicated by systemic ailments that make them poor risks. The degree of these risks is in proportion to the pathologic changes in the circulatory, renal or respiratory system. As a general rule, the subnormal patient does not tolerate anoxemia and should be kept under a light anesthesia, with a maximum of oxygen in the mixture. The following types of conditions may be classified as presenting subnormal anesthetic risks and should be handled accordingly:

Diabetes.—Nitrous oxide does not interfere with the carbohydrate metabolism in the body. It is therefore advantageous as an anesthetic for the diabetic patient. If a patient is losing sugar, he is on the verge of acidosis and is therefore susceptible to asphyxia. Anoxemia superimposed on anesthesia will cause a rise in blood sugar. Anoxemia should therefore be avoided in diabetic patients. They should be kept under a light anesthesia.

No anesthetic should be administered to these patients unless the urine is free from sugar, acetone and diacetic acid, and the blood sugar and carbon dioxide combining power are within normal limits.

Tuberculosis.—These patients usually offer good anesthetic risks. Slow induction with ample oxygen is indicated.

Pregnancy.—Pregnancy *per se* is no contraindication to gas oxygen anesthesia. However, a light plane of narcosis should be maintained since prolonged anoxemia may interfere with the oxygen supply of the fetus and endanger its life.

Thyroidism.—Hyperthyroid cases are difficult to manage because the anesthetic margin of safety is narrow. A change of as little as 2 per cent in the amount of oxygen in the anesthetic mixture will markedly alter the depth of anesthesia. Patients with hyperthyroidism should be premedicated with one-sixth to one-fourth grain of morphine.

Anemia.—Patients suffering from pernicious or primary anemia are very prone to anoxemia. Such patients may show symptoms of marked anoxemia after several inhalations of nitrous oxide-oxygen. Anemics having less than 50 per cent hemoglobin offer bad anesthetic risks and require a high percentage of oxygen in the anesthetic mixture. These patients usually do not become cyanotic. Color, therefore, is no guide to the stage of anesthesia. A patient afflicted with advanced anemia should be inducted with 50 per cent oxygen and the percentage increased or decreased in accordance with the symptoms. Patients with secondary anemia, due to loss of blood, should be handled in the same way as those with primary anemia. The anesthetic should be commenced with a high oxygen percentage and the anesthetist should feel his way slowly until the desired level is reached. In these patients, light anesthesia should be maintained.

Saturation with Sulfonamides. — The use of sulfanilamide and allied sulfa drugs in all oral infections is common practice. These drugs combine with the hemoglobin to form sulfhemoglobin, and may involve as many as one-third of the oxygen-carrying red cells. This creates a form of anemic anoxemia. These patients should therefore be anesthetized in the same manner as are true anemics; that is, with ample oxygen in the anesthetic mixture.

Gassing.—Gassing, especially with mus-

tard gas, causes fibrotic changes in the lung tissues. The passage of gases through these tissues is therefore interfered with and the transmission of gases, such as oxygen and carbon dioxide, and anesthetics from the alveoli to the blood and from the blood vessels to the alveoli is interfered with. This makes induction and maintenance of anesthesia and resuscitation in gassed patients difficult. It takes longer to anesthetize these patients. They take the anesthetic with apparent smoothness, then suddenly slump into anoxemia. Once they pass into deep anesthesia, it is difficult to resuscitate them, as the exchange of gases is slow.

Asthmata.—Severe asthma usually causes some constriction of the bronchioles. The amount of air or anesthetic gases passing from the lungs to the blood is consequently reduced. There is a deficient oxygen supply to the tissues, causing some form of oxygen want, depending on the severity of the case. Anesthesia in severe cases is difficult, since the patients have a tendency to pass into deep anoxemia.

Alcoholism.—The persistent use of alcohol causes changes in the blood vessels that hinder the free passage of gases such as oxygen from the blood to the cells. The oxydation process in the brain is interfered with, and thus these patients are susceptible to asphyxia. Alcoholics also develop a tolerance to drugs and require a relatively high concentration of the anesthetic for narcosis. They become obstreperous because, during induction, the conscious mind is anesthetized and the subconscious mind dissociates the patient from the restraining contact of his environment. Overstimulated and athletic patients should be anesthetized in a similar manner as are alcoholics. Premedication with morphine is recommended.

Status Lymphaticus.—In these cases, the enlarged thymus presses on the trachea and asphyxia results. Sufficient pressure must therefore be maintained to keep the airway open. Nitrous oxide and oxygen under pressure is a safe anesthetic in status lymphaticus. The induction is prolonged and should be carefully watched.

Infections and Tumors of the Neck.—In cases of tumors and infection of the neck, the air passages are constricted and breathing becomes difficult. The administration of nitrous oxide-oxygen or other anesthetics, under such conditions, is extremely hazardous because of the danger of asphyxia. A patient with Ludwig's angina and tumors of the tongue and floor of the mouth can be anesthetized with nitrous oxide-oxygen provided a light anesthesia, with ample pressure, is maintained.

Cardiac Conditions. — There is a marked disparity in opinions as to the use and effect of nitrous oxide-oxygen anesthesia for oral surgical procedures in heart disease. Some advise the use of only nitrous oxide and oxygen, while others assert that procaine without epinephrine is the anesthetic of choice in these cases.

While it is true that patients with heart block, congestion of the heart, bacterial endocarditis and hypertension may present cardiovascular difficulties during and after anesthetization, symptoms such as anginal seizures or paroxysmal tachycardia are precipitated either by strenuous excitement during induction or by anoxemia during the maintenance stage of anesthesia. A smooth, light anesthesia has no deleterious effect on the cardiovascular system. If a patient with hypertension, cerebral crisis or angina pectoris with infarctions on the heart is well enough to have teeth extracted, he is well enough to take nitrous oxide-oxygen, provided the excitement stage can be avoided and marked and prolonged anoxemia is eliminated.

I do not intend to imply that a patient with advanced heart disease, showing symptoms of severe dyspnea and irregularity of pulse, with edema of the legs and ankles, or giving a history of anginal seizures, offers as safe a risk as a normal

patient. These patients may die suddenly under any condition that will upset the mechanism of the cardiovascular system. Anesthesia is consequently a risk and the degree of risk is in proportion to the degree of muscular decompensation. On the other hand, if an operation has to be performed on these patients, they are, under a light nitrous oxide-oxygen anesthesia, just as safe as, if not safer than, they are under procaine. In case of cardiovascular difficulty, which may arise during local as well as general anesthesia, intracardial injections of stimulating drugs, such as adrenalin, may be life saving. Drugs affecting the peripheral vascular system, such as caffeine-sodium-benzoate hypodermically injected or nitroglycerine administered under the tongue may also prove to be invaluable.

Anoxemia.—Nitrous oxide-oxygen anesthesia is not produced by anoxia and its administration can be made anoxia free. If a safe oxygen level is maintained at all times, anoxemia is avoided. The occurrence of severe anoxemia is due primarily to either carelessness or inexperience. When anoxia is produced, nitrous oxide ceases to be a harmless agent, and its use can result in acidosis and liver and other organic damage, due to anoxemia. Severe anoxemia results in capillary hemorrhage and edema of the brain and other organs. Cells in the cerebral cortex and lenticular nucleus undergo degenerative changes resulting in serious neurologic complications.

Cerebral Damage Due to Anoxemia in Nitrous Oxide-Oxygen Anesthesia.—The extent of cerebral damage depends on the duration and severity of anoxemia or on the duration of the respiratory and circulatory disturbance. Nitrous oxide anesthesia, if carried to a state of asphyxia, might have several effects upon the patient:

1. Temporary injury to the brain. The patient recovers from the anoxemic effect of nitrous oxide anesthesia within from several hours to a day or two, and presents no residual effect on the cortex.

2. Severe cerebral damage. The symptoms of asphyxia persist for several days and the patient may finally regain consciousness, but shows symptoms of definite residual cortical damage, such as impairment in speech and vision or mental aspect. Such patients may never fully recover their mental powers.

3. Extensive cortical damage. The patient may linger on from the depressing anoxemia due to nitrous oxide anesthesia for several days and even weeks, with marked convulsive muscular spasms, and later coma. The brain degeneration may cause death.

4. Although in many instances of sudden death under nitrous oxide anesthesia, some contributory factors can be found for the patient's death, there are cases in which death is due to asphyxia.

It is evident, therefore, that although nitrous oxide is the safest and least toxic of all inhalation anesthetics, the accompanying anoxemia may cause varying degrees of cerebral damage that can result in death.

CONCLUSION

As a general rule, it can be noted that patients with a low metabolism, such as the aged, weak and cachectic, or those whose metabolism has been lowered by depressing drugs, such as morphine, are easily anesthetized and require more oxygen, while patients with high oxygen consumption, such as alcoholics, athletes and the thyrotoxic, are difficult to anesthetize and should be premedicated with morphine. Although there has been much hesitation in administering nitrous oxide-oxygen anesthesia in cardiac cases, it has been our experience that a smooth, light gas anesthesia has no deleterious effect and is at least as safe as procaine.

BIBLIOGRAPHY

SELDIN, H. M.: Practical Anesthesia for Dental and Oral Surgery. Philadelphia: Lea & Febiger, 1942.

Idem: Pitfalls in Nitrous Oxide-Oxygen Anesthesia. *Am. J. Orthodontics,* 27:389-393, July 1941.

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THE RED CROSS IN WAR TIMES

WE are impelled at this time, when the many casualties on the various battle fronts have become a serious problem to the Army, to direct special attention to the welfare activities of the Red Cross in times of war. Among the notable relief activities of the Red Cross for the men who are today fighting our far-flung battles, one of the most vital and important is that of the blood donor service.

Blood that is being contributed by hundreds of thousands of volunteer donors through the efforts of the Red Cross is saving the lives of our soldiers and sailors wherever they are engaged in the grim task of war. The remarkable record that is being made in lessening the fatalities to the wounded is indicated by the tribute which the Surgeon General of the Navy, Rear Admiral Ross T. McIntire, paid to the efforts in this direction. Surgeon General McIntire said:

"It is astounding but perfectly true that the Navy is losing less than one per cent of the wounded at Guadalcanal. In the First World War, more than seven per cent of the wounded died of their wounds. These figures exclude men killed in action."

The wounded are flown to a hospital often several hundred miles

away. Before being moved, and often on the battlefield, they may receive first aid to stop hemorrhage and reduce shock, and they may also be given plasma transfusions and other treatment.

Although in the midst of war it is difficult to obtain details, nevertheless from the world's battle zones have come reports indicating the important rôle of plasma in caring for the wounded.

As specific examples of instances of such care in the battle line, there was Leonard Frontakowski, boatswain's mate aboard the destroyer *Kearny* when she was torpedoed the night of October 16, 1941. Injured almost unto death, he received three transfusions while the vessel limped into port, and several more after transferal to hospital ashore. There was Sam Kurtz, too, torpedoman aboard the same ship. He lost both legs, but is alive today, thanks to fifteen plasma transfusions. It was Kurtz who, in September 1942, came to Washington from the Philadelphia naval hospital and hoisted the Army-Navy "E", presented to the American Red Cross Blood Donor Service for its splendid work.

Another instance was that of Wayne Fogelstrom, who survived Pearl Harbor with severe burns and a fractured leg. Infection and hemorrhage threatened serious outcome, but six transfusions helped him to survive injury. Mel Van Kuren, credited with having shot down the first Japanese plane at Pearl Harbor, is still another who cherishes a feeling of gratitude to the people who are giving their blood to help save the lives of their fighting men. Severely burned, Van Kuren received eight transfusions with plasma sent to Hawaii by the American Red Cross.

During 1942, more than 1,000,000 donors responded to the call of the collection centers. Last January 16, the Army and Navy requested the Red Cross to provide 4,000,000 donations in 1943. This means an average of 80,000 each week.

To meet this increase, seven new donor centers have been opened, and today these number thirty-one, located in the following cities: Boston, Hartford, Brooklyn, New York, Schenectady, Rochester, Buffalo, Pittsburgh, Harrisburg, Philadelphia, Baltimore, Washington, Atlanta, New Orleans, Cleveland, Cincinnati, Columbus, Detroit, Indianapolis, Chicago, Milwaukee, Minneapolis, St. Paul, St. Louis, Kansas City, Denver, San Antonio, Los Angeles, San Francisco, Oakland and Portland.

The 1943 Red Cross War Fund campaign emphasizes two things concerning the Blood Donor Service: Donors are absolutely essential

to keep it going, and contributions to the War Fund are essential to help maintain the donor centers. While many volunteers are engaged in this work, physicians and other professional personnel must be engaged, quarters must be rented, scientific equipment must be bought, donations must be transported to the processing laboratory and many other expenses must be borne.

Today the American Red Cross reaches around the world. It has 3,750 chapters and 6,145 branches in this country and its possessions. Its representatives are stationed at Army camps and Naval stations throughout the United States and abroad. Its establishments and personnel are to be found in Greenland, Iceland, the British Isles, North Africa and the Middle East, India, Australia and many of the islands of the southwest Pacific, serving the men of the Army and Navy.

This work is essential to the morale and welfare of our fighting men, and to maintain these activities the Red Cross is entirely dependent upon voluntary contributions and gifts. Every American is urged to keep this work going by contributing to the 1943 Red Cross War Fund.

Although the armed forces come first in the Red Cross scheme of things, service on the civilian front is not being overlooked. Chapters have strengthened disaster relief plans and are preparing for any contingency. In industrial areas, first aid detachments have been organized. Red Cross volunteer corps have been expanded, and several hundred mobile canteens and disaster relief units have been placed in operation at strategic points throughout the country, so that, should emergency arise, a reserve of material and manpower will be available.

Red Cross work is financed from voluntary contributions and gifts. Support of the Red Cross War Fund will assure preparedness on the home front.

SALVAGING DENTAL MATERIALS

RECOGNIZING the fact that the all-out war effort needs all scrapped and obsolete rubber and metal products to compensate for a shortage of new material for the production of numerous items necessary to facilitate the war effort, the American Dental Association last December appointed a national dental salvage committee for the purpose of nationalizing the salvaging project.

Accordingly, a committee consisting of Dr. Harold J. Cronin, Dr. J. V. Gentilly, Dr. H. E. King, Dr. H. B. Higgins and Dr. Henry A.

Swanson, Washington, D. C., chairman, formulated and outlined a national dental salvage program designed to salvage all available materials from the dental offices throughout the country.

Committees have been appointed in all the states and the campaign is being broadly publicized. The initial drive has been under way now for about three months, and while the results have been highly gratifying, there are still many dentists who have failed to respond to the plea for donations of the necessary critical items lying around their offices and serving no useful purpose.

Scrap metals are necessary to keep the mills going to produce the raw material needed to build tanks, planes, ships, guns and ammunition. Approximately 40 per cent of scrap metal is needed for every 60 per cent of pig iron used, and the efforts to recover scrap tin, copper, lead and the various alloys become increasingly urgent as the shortage of these materials becomes more critical.

Salvage and reclamation of rubber items to supply new parts to the war machines is vital to the war effort as it readily becomes an aid in furnishing to the fighting forces supplies and ammunition by means of the supply trains and, too, it is a source of the rubber life rafts on bombers and planes that may be the means of rescue of a crew forced down on the high seas. General Rickenbacker's recent experience is a classic example of the rescue value of rubber rafts.

The committee has established collection depots in every city and state and the dental supply houses and laboratories are lending valuable assistance in getting the scrap material to the depots.

The aim of the committee, with the help and aid of every dentist, is "get out the scrap" regardless of any financial return, and may the effort in this direction help to "beat the Axis."

As to the disposition of the material, the committee has provided that the rubber, steel, iron, copper, brass, aluminum and lead items shall be sold to the scrap dealers, and the proceeds from the sale of the material is to be used to purchase War Savings Stamps and Bonds. The stamps and bonds are to be donated to the American Dental Foundation, held until maturity and then devoted to the purposes of the Foundation. Or the stamps and bonds are to be turned over to the component or state society and at maturity devoted to some worthy society cause.

The chairmen of the state communities are to report to Dr. Henry A. Swanson, chairman of the Committee on Dental Salvage, 1726 Eye Street, N.W., Washington, D. C.

GET OUT THE SCRAP AND HELP BEAT THE AXIS!

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WAR SERVICE COMMITTEE

MEETING IN CHICAGO

THE voluntary achievement of the 1943 procurement objective for dentists and the new program for dental schools under military direction, were the main subjects under discussion at a meeting of the War Service Committee of the American Dental Association. The meeting was held in connection with the semi-annual meeting of the Board of Trustees, Palmer House, Chicago, on February 20. Dr. C. Willard Camalier, chairman of the committee, was in charge of the program which included such speakers as Brigadier General Robert H. Mills, Chief of the Army Dental Corps, George St. John Perrott, National Health Institute, Captain C. Raymond Wells, chief Dental Officer of the Selective Service System and President-Elect of the American Dental Association and Dr. John T. O'Rourke, chairman of the Committee on Dentistry, Office of Procurement and Assignment.

In addition to outlining plans for the procurement of dental officers in 1943, details of the new army and navy program in the dental schools were revealed. All schools of the country with the standard dental course will be asked to participate by the armed services. Students will be chosen by boards established in the various Service Commands and will enter schools as privates in the Army or as seamen in the Navy. Those now having commissions in the various reserve corps will be given an opportunity to resign those commissions and enlist for assignment to dental schools for study. Army and navy officers will be assigned to the various dental schools to act as liaison officers between school officials and the branches of the service. These officers will not, however, develop any physical fitness programs in the dental schools. There will be no material change in the present content of the dental curriculum.

In opening the session Dr. Camalier announced that an attempt will be made to reach 1943 procurement objectives on a voluntary basis. Brig. Gen. Mills disclosed the decision that dentists would be sought from the states on a quota basis. This action was taken to prevent serious dislocations of dental personnel in those states where enlistments have already had an influence on the normal patient-dentist ratio. No dentists will be accepted for commissions, General Mills stated, unless they have been designated as "available" by state Procurement and Assignment committees. Lists of available dentists will then be compiled and the dentists named will be invited to seek commissions.

Gen. Mills stated that there is a present shortage of dentists in the army in fixed installations but that the present procurement rate would diminish this lack.

Dr. John T. O'Rourke, chairman of the Committee on Dentistry, Office of Procurement and Assignment, revealed the studies that had been made by his committee on dental personnel problems. Dr. O'Rourke indicated that an attempt would be made to maintain a dentist-patient ratio of 1 to 2,500 except in those states where the original ratio had been more than that figure. In those states, an effort would be made to prevent a depletion of personnel below a level determined by local conditions.

In 1942, Dr. O'Rourke stated, thirty-

two states had exceeded their quotas in the procurement of dental officers while sixteen states had exceeded both 1942 and 1943 procurement quotas, through voluntary means.

Dr. Gerald D. Timmons, vice-chairman of the War Service Committee, discussed the results obtained from the analysis of the questionnaires returned to the American Dental Association in the Dental Preparedness Survey. Dr. Perrott also gave the results of studies that had been made on dental personnel in the establishment of the state quota system.

Captain Wells announced that the Selective Service System had given considerable attention to the maintenance of a satisfactory supply of dental technicians. He announced that laboratories had been requested to undertake a replacement training program for one-fourth of their staffs so that men of non-draft age and women could be trained in that work.

ELIGIBILITY OF DENTISTS FOR TIRE AND GAS RATIONS

The following authoritative statement, approved by the Office of Price Administration, was released by the War Service Committees, February 3, to aid members when they appear before their local rationing boards for gasoline and tires:

Under the Gasoline Rationing Regulations for the national program, the owner or person entitled to the use of a passenger automobile may be issued a basic A ration which provides for 240 miles of driving a month (180 in the Eastern gasoline shortage area), calculated on the basis of 15 miles per gallon of gasoline.

If dentists have occupational mileage in excess of the 150 miles a month (90 in the East) which is deemed available for such purposes in the basic ration, they may be eligible for a supplemental B ration. This B book will provide for additional occupational mileage up to 320 miles a month (288 in the East) if the applicant demonstrates that the mileage is needed for his work; that a bona-fide ride-sharing arrangement has been made, or that it is impossible to do so and that reasonably adequate alternative means of transportation are lacking. The combined A and B rations make 470 miles a month (378 in the East) available for occupational driving and 90 miles a month available for home necessity use. In most cases this amount will be adequate for the essential driving needs of dentists.

No member of any medical profession is *per se* eligible for such mileage. The C book, tailored to actual requirements by the local War Price and Rationing Boards, is granted to physicians, surgeons and dentists for the purpose of making necessary professional calls or for rendering necessary professional services, if the qualifications for the B ration are met.

A great majority of dentists, like specialists in other fields of medicine, practice in their own offices. Since preferred mileage is not granted to any practitioner in any branch of medicine for driving between home and private office, most dentists are not eligible for the C ration. A dentist is also not eligible for preferred mileage if he does not regularly make professional calls outside his office. It must be emphasized that the Regulations govern surgeons, physicians and dentists in precisely the same fashion.

In the Mileage Rationing Program, the Tire and Gasoline Regulations have been so integrated that every one is eligible for tires of the quality needed to give him the mileage allowed by his gasoline ration.

If a dentist possesses a recappable tire carcass, he must, with the exception noted below, accept tire recapping service with passenger-type camelback. If he does not possess a recappable tire carcass he may obtain a replacement tire, the quality of which will depend upon the mileage granted him in his gasoline ration. If he has received

an A or B book, he may obtain a Grade III tire. If he is the holder of a C book, allowing less than 1,000 miles per month, he may obtain a Grade II tire. If his C ration provides for more than 1,000 miles of driving per month, he may obtain a Grade I tire.

An exception to the above system of tire eligibility is made in the case of dentists who clearly establish that they must answer emergency calls which require the operation of a passenger automobile at high rates of speed. Dentists falling in this category may obtain any grade of tire desired.

Apparently, there has been in the minds of some of the dental practitioners the thought that members of the dental profession would not be considered in the same category as physicians, ut in a letter from John R. Richards, chief, Gasoline Rationing Branch, there appear these two sentences: "1. It must be emphasized that the regulations govern surgeons, physicians, and dentists in precisely the same fashion. 2. No member of any medical profession is *per se* eligible for such mileage."

The interpretation of the word "doctor" as carried in the Preferred Mileage Guide now in the hands of local rationing boards may be confusing to some, and the following is quoted from a letter from the Office of Price Administration, should some such question arise:

In a recent conversation with this office you stated that the use of the word "doctor" on page 19 of the Gasoline Rationing Guide No. 1 to Ration Order No. 5C raised some doubt in your mind as to whether dentists are included among the persons enumerated in the section referred to above. The reference to a doctor in the Guide is for illustrative purposes and in any event it could not modify the explicit language of the section, which expressly includes dentists.

While a physician, dentist or other person enumerated herein may not ordinarily receive preferred mileage for travel from home to office, the paragraph in question does provide for preferred mileage under certain circumstances, as set forth in the same letter:

While a doctor, dentist or other person enumerated in Section 1394.7706 (g) may not ordinarily receive preferred mileage for travel to his office, the paragraph in question does provide that where he maintains more than one he is entitled to preferred mileage for travel between such offices. There is no restriction as to the location of his offices and hence if a doctor or dentist maintains two or more which are located in different communities, he may nevertheless receive preferred mileage for necessary travel between them.

Where a doctor's or dentist's practice is wholly or partially in rural communities he may, of course, obtain preferred mileage in order to make professional calls on any of his patients in such localities irrespective of whether they reside at home or in public or charitable institutions. If he is connected with any such institution and is furnished with office facilities to treat its inmates, such office would not ordinarily be considered one which is maintained by him within the meaning of that paragraph. However, that office may be at a hospital establishment or may itself be a hospital facility. In that case, if his travel is for purposes necessary to the operation or functioning of such hospital establishment or facility, he may be entitled to preferred mileage under the provisions of Section 1394.7706 (o) (1).

Reasonable and self-sacrificing cooperation with your local rationing boards is strongly advocated. However, appeals may be made to local and state appeal authorities.

BUREAU OF PUBLIC RELATIONS

ORTHODONTICS*

WITH much emphasis being placed on appearance, it is not surprising that the teeth, one of the most prominent of the facial features, should come in for a large share of attention. An even row of well-kept teeth is one of the prime essentials to good looks. Certainly nothing detracts more from the beauty of the face than jumbled or protruding teeth.

A very real source of concern for children afflicted with this type of dental deformity lies in the realm of psychology. Playmates or schoolmates are thoughtlessly cruel and altogether too ready to single out a child with "buck teeth" as an object of ridicule. Taunted and laughed at, such children are not infrequently driven in upon themselves to the point where they shun contact with strangers, or even begin to show behavior habits that puzzle all but the alert psychiatrist.

It usually happens that only when parents begin to detect signs of irregularity of the teeth in their own children do they begin to think about the problem. Upon discussing it, usually with lay friends at first, they are apt to be bombarded with all sorts of information, both true and false, and an equal amount of advice, both good and bad. It is the purpose of this pamphlet to consider some of the questions that are debated, to dissect the facts from the fancies, and to attempt some sort of guidance for people in these circumstances.

The science that deals with the correction of irregularity of the teeth is called orthodontia or orthodontics, and the man who practices this specialty is called an orthodontist. The word has two Greek roots, *orthos,* meaning straight, and *odous,* meaning tooth. Actually, the teeth are not crooked—they are only arranged unevenly. The fault usually lies with the bone that holds them. Hence, the problem of crooked teeth is a bone problem and must be handled as such.

One of the questions most frequently asked the orthodontist is, "What caused my child's teeth to come in crooked? I brought him up just as the doctors directed and provided him with a proper diet, but, in spite of all that, just look at his teeth." Usually, the orthodontist can answer the question readily, but sometimes he is as completely baffled, as are the parents. What, then, is known about the cause of "crooked teeth," or malocclusion?

THE CAUSES OF MALOCCLUSION

Familial Traits.—The striking similarity, in some cases, between the tooth arrangement of the parents and that of the child has been noted and written about for 200 years or more. Such similarities are held to be evidence of the hereditary transmission of malocclusion, and there seems to be little doubt that, in many cases, heredity does play an important rôle. It should not be forgotten, however, that many children do not exhibit dental patterns that resemble those of their parents. These cases are apt to be overlooked, like the case of

*The growth of public interest in dental health has resulted in a marked increase in requests for information on different phases of the subject. To meet this demand, the Public Health and Education Committee, now a subcommittee of the Council on Dental Health, has authorized the preparation of a series of twelve articles in pamphlet form, each article to deal with one of the dental questions most frequently asked by the public.

"Orthodontics," by Allan G. Brodie, D.D.S., Ph.D., is the third of this series. Reprints at nominal cost can be obtained by addressing the Bureau of Public Relations, American Dental Association, 222 E. Superior St., Chicago, Ill.

the minister's son who does not go wrong.

Recent research in this field tends to indicate that the characteristics of any child are totally unpredictable on the basis of parent characteristics, and that the various units comprising an individual are apt to be a conglomeration or mixture of the traits of several generations. Unless the parents have malocclusion of a similar type, the chances are no better than even that the child will inherit the deformity of one parent. Even with identical malocclusion in the parents, it would be unwise to bet heavily on one of their children's inheritance of the same condition. In our present state of knowledge, the entire mechanism appears to be on a basis of chance.

Developmental Factors — Congenital Defects.—Once conception has taken place, hereditary factors can no longer operate. We now enter the pregnancy or embryonic stage and, thanks to a great deal of research and experimentation, are on ground that is better explored. What may be expected in this stage?

During approximately the first three months of pregnancy, the future being is called an embryo. During this period, there occurs a rapid chain of complex events, which witnesses the transformation of a single cell into a fully organized being composed of millions of cells. True, this being is extremely small, but it contains all of its essential organs and parts even at this early age. Since this period is probably the most critical of all in the entire span of life, it will pay us to pause and consider it a little more carefully.

The embryonic period might well be called the planning or blueprint stage. It starts with a single tiny cell, which rapidly multiplies into a mass of cells, which soon begin to show localized specialization. This specialization results in the development of the organs and parts, which appear in rapid succession. There is a definite sequence in their appearance, with the brain leading. About the thirty-fifth day, the cells that form the teeth are laid down in the parts that are destined to become the jaws.

Our interest in this period is great because it is during these three critical months that so-called congenital defects occur. If, during this time, the embryo is subjected to adverse conditions, those processes which are operative at that particular time are apt to be disturbed or inhibited. Normal processes that should occur do not occur, and we may have such conditions resulting as cleft palate, harelip and missing teeth. The last six months of pregnancy constitute the period during which the child, having been formed, grows to its birth size. Any condition that acts upon it from now on can affect only the relative size of its parts, and this continues to hold true after birth as well as before.

The conception, development and birth of a child is a very complex process, and the manner in which Nature protects the unborn child is one of the greatest of wonders. Healthy babies are born to mothers who have suffered all sorts of untoward conditions during pregnancy, since the demands of the baby seem always to come first. But there is no contradicting the fact that the healthiest babies are born to the healthiest mothers, and that mothers who do not take proper care of themselves during pregnancy are running the risk of harming the children that they are bringing into the world. So much for the prenatal period. What of the child after it is born?

Habits.—Once a child is born, it becomes subject to all of the effects of its environment and to accidents. It must rely on its elders for proper food, for the formation of proper habits and for protection against harm. Leaving the question of proper food to the pediatrician, let us consider the habits that may prove harmful unless curbed. Chief among these is thumb or finger sucking.

It seems to be a natural instinct for a baby to put things into its mouth, and its own fingers are among the choicest objects. Psychologists are still endeavoring to determine the primitive instinct that lies back of this urge and have advanced widely divergent views. Some say the habits are prompted by hunger, others that it is an indication of an unsatisfied sucking reflex that results from its getting its food too easily. Still others assert that it has its roots in fields that are not related to the taking of food. But, regardless of its cause, it must be watched or it will do damage to the jaws.

Living bone is not the hard, unyielding material that we are accustomed to see in museum specimens. To the contrary, it is probably the most easily molded tissue in the body, reacting easily to forces to which it is subjected. Furthermore, it is no stronger than it needs to be to perform the duties for which it was designed. The bones of a human being were designed to be used according to human function; and so long as they are so employed, they will remain normal. Let them be constantly used in a manner for which they were not intended, and they will conform to the new function and deformity will result. Well-known examples of this are the legs of the cowboy, the feet of Chinese women, the flat heads of certain Indian tribes or the spinal curvatures of people who constantly carry loads on one side of the body. Thumb sucking and other habits which bring steady and unusual pressures to bear on the delicate bones of the face act in a similar manner.

It should not be inferred from this that all thumb sucking will cause protrusion of the teeth. A number of facts will determine whether a deformity will result. First, there is the same variation between individuals in regard to susceptibility as is found in other bodily conditions. In other words, some children who are ardent and persistent thumb suckers will appear to show very little or no effect of the habit, while others who indulge the habit rather lightly will be greatly deformed. Another determining fact is the amount of time that the habit is active. If a child puts the thumb in its mouth for a few minutes just as it falls asleep, or upon awakening, there is a small chance that any damage will be done. If it is more persistent than this, there is danger. From these statements, it should be apparent that the best procedure is to break the habit as early as possible or, better still, never let it get started.

On Breaking Habits.—An infant begins to form habits the instant that it is born, and just as its growth is at its highest rate during infancy, so is its habit formation. But habits are good or bad, and the good outnumber the bad many, many times. If adults had to think consciously of every slight movement during the course of the day, they would accomplish very little, yet that is the task facing the baby. Each common movement must be learned and perfected by endless repetition; yet, when one watches a baby beginning to walk, it is not usually appreciated that it has within a few days learned a trick that involves the coordination of several senses and hundreds of muscles. Habit formation saves us tremendous mental and physical energy.

If, then, a baby can learn complicated useful habits so rapidly, it should be apparent that it could very quickly become fixed in such a primitive habit as sucking. And *any* habit, good or bad, is hard to change and becomes steadily harder as age advances. A short period of alertness at an early date will eliminate months of heart-rending effort later on.

This calls for persistence on the part of the parents. If the infant is *invariably* prevented from putting its fingers in its mouth during the earliest months, it soon comes to realize that this is on the list of forbidden acts and it refrains from it quite automatically. If, on the other hand, correction is sometimes made and

sometimes not, the whole performance becomes a guessing game, with the infant trying to see how often it can "get away with it." Babies develop a knowledge of how to rule their parents at a much earlier age than is generally thought.

If the habit has become ingrained and the resolve is made to break it at a later age, the same principles must be borne in mind. A definite program of correction must be undertaken, and it must be rigidly adhered to. And now it will be the parents who will suffer more than the infant. Whenever the thumb is found in the mouth, it must be removed and some means employed to keep it out. Few active children will exhibit the habit during their waking hours, so this usually becomes a night problem. There are many different methods that may be employed. The drawstrings of the nightgown sleeve may be tied tightly, with the hand up inside of the sleeve. If the baby does not like the feeling of cloth in its mouth, this may be all that is necessary. Aluminum mits may be tied on the hands. These are too large to permit their being put in the mouth. The bare fingers may be painted with harmless, bitter substances, the taste of which discourages sucking, etc. But any means employed to thwart the child in his efforts to continue the habit is apt to lead to rebellion in the form of crying, and unless the parents can steel themselves to hearing this for two, three or four nights, which is the usual period, they had better not attempt to correct the habit. It must be an all-out effort or the habit will only be accentuated. If such a habit can be broken before the age of 5, however, the teeth will frequently return to the normal positions.

Mouth Breathing.—For many years, attention has been called to the typical facial pattern of children who habitually breathe through the mouth instead of the nose. There is usually a drawn expression about the mouth and eyes, and the nostrils are narrow, the upper lip is short and elevated and the lower lip is heavy and everted. The upper teeth frequently protrude and the whole face has an expression of dullness or stupidity. Such children, failing to use the filtering and warming mechanism provided by the nose, usually suffer from constantly recurring colds of the "sniffling" variety.

The arrangement of the teeth caused by or accompanying this condition is quite characteristic. The upper arch is narrow and the front teeth protrude over the lower lip and are frequently spaced. The upper and lower teeth are seldom in contact and the lower jaw appears to hang down.

The cause of this condition lies in some form of nasal obstruction, usually enlarged adenoids. The child is unable to obtain sufficient air through the nose and resorts to the only possible alternative, mouth breathing. The unnatural pressure that the facial muscles now bring to bear on the delicate bones of the face mold them into the form that has been described.

Obviously, the first step in the treatment of a condition of this sort consists of removal of the cause, or surgical removal of the obstruction. In many cases, such relief will be followed by a spontaneous change from mouth to nose breathing. Other cases will not show such a change in habit, and a period of training should be immediately inaugurated. This may consist of muscle exercises designed to strengthen the lips to the point where they will stay closed involuntarily. In other cases, the teeth will be so far out of the normal position that the easy closing of the lips is not possible. In such cases, orthodontic regulation of the teeth is the only solution.

WHEN SHOULD TEETH BE STRAIGHTENED?

The time for straightening the teeth is another question frequently asked, and again no general answer can be given. There are some cases, as that of the underslung or projecting lower jaw, that

should be corrected as soon as they are noticed. In others, correction can be deferred until all of the second teeth are in the mouth. Only an experienced orthodontist can decide when treatment should be instituted, but there are a number of conditions that should cause the parent to seek competent advice.

Sometimes there is a tendency for a child to have difficulty in eating. It is usually first noted when it is placed on a semisolid diet. When food in even a moderate amount is placed in the mouth, the baby gags, slobbers and frequently vomits. Such a condition is not infrequently blamed on a "weak stomach" or disturbed intestinal tract, and all sorts of treatment may be employed, to no avail. The fault may well lie in the manner in which the teeth come together when the jaws are closed.

From birth, the jaws are apart even though the lips are closed. The tongue is quite large, relatively larger than in the adult, and occupies virtually all of the mouth cavity. It is only at a later date, when its teeth have erupted, that the tongue comes to lie within the arches formed by these organs. The tongue continues even then to occupy all of the mouth cavity within the arches. The upper and lower teeth, coming into place, continue to erupt or grow until the upper teeth come in contact with the lower teeth, and prevent the jaws from being closed too far; that is, any crowding of the tongue beyond a normal limit is prevented. In some cases, the teeth do not strike against each other when they erupt. The lower teeth pass completely within the upper arch, and it is possible for the lower teeth, under these circumstances, to reach and strike the roof of the mouth all around the arch. In other words, there is no stopping action by the teeth and the lower jaw is telescoped within the upper. Under these conditions, the tongue is severely crowded and is forced back into the upper part of the throat. Without food in its mouth, the infant has no trouble adjusting himself to his deformity, but when food is added to an already overcrowded mouth and the jaws are closed more tightly than is normal, the insult is too great, and the gagging reflex that any one can elicit by pushing a finger down the throat becomes active. In a case of this type, relief can be afforded quickly by widening the lower dental arch to a place where the teeth strike each other on closing.

Probably the most frequent need for orthodontic treatment of the baby teeth results from premature loss of the teeth. Some children have a good deal of decay, which may lead to extraction of teeth. Others shed certain important teeth before the time for them to be lost. In either case, and according to which teeth are involved, the remaining teeth may close in and cause crowding of the permanent teeth. This can frequently be prevented by employing passive devices, called space maintainers, to hold such spaces open. It must be done promptly, however, if it is to accomplish its aim.

In many children, there is a stage during the replacement of the deciduous teeth by the permanent teeth when there is an extreme jumbling of the teeth. This is particularly true in case a child is growing slowly, but is getting the teeth earlier than usual. It should be pointed out that the crowns of the teeth are of adult size long before they appear through the gums. The jaws, on the other hand, continue to grow until the eighteenth or twentieth year. It is for this reason that only one pair of teeth appear during the same period. Between periods, growth goes on and the jaw increases enough to hold the next pair. If eruption precedes growth, however, the jaw has no opportunity to prepare and the teeth wedge themselves into place by twisting and overlapping. Provided normal growth occurs subsequently, the teeth will frequently aline themselves in good order.

Another condition that frequently disturbs parents is the presence of a space between the upper front teeth; particularly between the upper central incisors. In the great majority of cases, this is only a passing phase of development. The space that appears so wide when the two central incisors erupt is seen to narrow as the lateral incisors come in and then gradually disappear entirely when the large and powerful canines force their way down into place. A faulty diagnosis of "enlarged frenum" (the ligament on the inside of the middle of each lip, connecting the lips with the gums) is often made and operations have been performed on countless children as a preventive measure. It is doubtful whether it has done much good in the majority of cases. When the frenum is actually enlarged, as it occasionally is, operation should be deferred until all of the second teeth are in place. The decision should be left to a competent orthodontist.

The question is often asked, "Will braces cause my child's teeth to decay or weaken them in any manner?" Years ago, when appliances consisted of bars and wires that lay in direct contact with naked tooth surfaces, there was danger that cavities would develop at such points of rest. This danger has been largely overcome by placing and cementing bands on teeth that are to come in contact with the appliance, except in the case of the tongue surfaces, which enjoy a peculiar immunity and seem to need no protection. It should be pointed out, however, that the presence of anything foreign in the mouth leads to food accumulation and such food will cause decay if not removed frequently and thoroughly. Decay caused in this manner occurs where there is no appliance; that is, between bands and gums. Careful brushing, verified by subsequent examination of the teeth in a mirror, will remove all danger of decay.

Teeth are just as firm and usually far more useful after orthodontia than before. The bone changes that occur around a moving tooth are similar to those that Nature employs to mend a broken bone, and, in a short while after treatment has been completed, even the x-rays will fail to reveal any sign of treatment. Occasionally, it will be noted that the tips of the roots have been blunted somewhat, but this should not occasion alarm unless the condition is severe. The cause is not understood, but it is thought to be due to a constitutional condition rather than to regulation of the teeth, because many people show such blunting without orthodontic treatment.

The length of treatment depends on the case, ranging from a few months to several years. If it is a matter merely of alining teeth, bringing some of them "over the bite," etc., a course of treatment covering twelve months or less will suffice. If, on the other hand, there is a developmental problem, correction is apt to take longer. In such a case, the orthodontist may divide the treatment into several stages, each stage aimed at bringing the development up to the child's age. Such a program can end only after all the teeth, including the second permanent molars, are securely locked in position.

In all work undertaken, the patient must cooperate with the orthodontist for the best results. Such cooperation is called for in the wearing of elastic bands, in the home care of the mouth and in exercises when indicated. There are many cases in which such cooperation is the key to success. If the patient fails to cooperate, or if the parents fail to see that he does so, they might better save their money and the orthodontist's time, since the results of the treatment will be unsatisfactory or discouraging. With conscientious cooperation, however, there is probably no dental care that yields higher dividends to the patient in satisfaction, happiness and health than orthodontia.

COUNCIL ON DENTAL THERAPEUTICS

VINYL ETHER (VINETHENE)

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THE Council has authorized publication of this report as one in its series on pharmacology and therapeutics. The opinions expressed are those of the author and do not necessarily reflect the opinion of the Council.—DONALD A. WALLACE, *Secretary.*

VINYL ether is an inhalation anesthetic recommended for use in short operative procedures, not to exceed one-half hour. There have been numerous reports dealing with this phase of its use, no fewer than 50 per cent having been in the field of dentistry.

PHYSICAL PROPERTIES OF VINYL ETHER

The product, marketed commercially as vinethene, consists of approximately 96.5 per cent pure vinyl ether, 3.5 per cent absolute alcohol and 0.01 per cent of an oxidation inhibitor (phenyl-alpha-naphthylamine). The alcohol is added to prevent freezing of moisture on the mask or in the gas machine, due to the cold induced by the high volatility of vinyl ether. The anti-oxidant is added to limit the rapid decomposition that results when the anesthetic agent is exposed to air and light. It is considered advisable to discard any of the agent that may remain after the original container has been open longer than twenty-four hours.

The commercial product, a colorless fluid with a slight purplish fluorescence, has a faint garlicky odor. Its boiling point is 83.0° F. (28.3° C.) and it is highly inflammable and explosive. The inflammability and explosiveness are of about the same order as those of ethyl ether. Vinyl ether decomposes when contaminated by acid.

PHARMACOLOGIC PROPERTIES[1, 2, 3, 4]

Vinyl ether is similar to the methane series in pharmacologic actions. It differs from ethyl ether in that it is much more potent and its action is rapid. Because of these properties, the usual landmarks in the various planes of anesthesia fail to offer the anesthetist protection against overdosage. "Pushing" the anesthetic may easily result in overstepping the stage of surgical anesthesia and entering plane four, with arrest of respiration. The eye signs, which are of great value in regulating the depth of anesthesia with other anesthetic agents of the methane series, are entirely unreliable with vinyl ether. One must rely solely on the character of the respiratory movements. The stage of surgical anesthesia is characterized by a quiet, full, regular and an only slightly accelerated respiratory rate, with the eyeballs "active." In the deep plane of surgical anesthesia, the eyeballs usually become fixed and the pupils may dilate. Cyanosis is an exception, its development indicating the need for the employment of oxygen.

In man, surgical anesthesia with satisfactory abdominal relaxation requires a concentration of vinyl ether in the blood of 18 mg. per hundred cubic centimeters, while for minor surgery a concentration of 11 mg. is sufficient. There are no reports on the blood concentration that is lethal in man. It has been estimated that the relative anesthetic potency of vinyl ether is 7:1, as compared to ethyl ether. Although it would appear to have

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a wider margin of safety than ethyl ether in animals, actually its use is probably more hazardous because of the ease with which deep planes of anesthesia are entered.

TOXICITY[5, 6, 7, 8, 9, 10]

Liver Damage.—Early studies suggested that the prolonged use of vinyl ether in animals resulted in central necrosis. Some workers believed this to be due to anoxemia because they were able to prevent it by reinforcing the anesthetic with oxygen. Others believed the reason to be a deficiency in the sugar stores of the liver, because a high carbohydrate diet protected the liver against damage. Clinical studies have indicated that this danger can be avoided if excessive dosage, prolonged use or coincidental anoxemia is avoided. Animal experimentation shows that vinyl ether is less toxic to the liver than chloroform, but more so than ethyl ether. It is obvious that patients known to have liver disease should not be anesthetized with vinyl ether.

Kidney Damage.—There are too few studies reported from which to draw any definite conclusions on the effects of vinyl ether on the kidney. While, in the dog, vinyl ether appears to have a depressing and irritating effect, studies in man did not confirm this. The literature contains the report of one case of the development of a hepatorenal syndrome (a condition in which the liver and kidneys are damaged simultaneously) following the use of this agent.

Cardiovascular System.—There is no evidence that vinyl ether anesthesia has any adverse influence upon the heart. In animals, epinephrine-induced arrythmia occurred much less frequently in dogs anesthetized with vinyl ether than in those under cyclopropane or chloroform anesthesia, vinyl ether resembling in this respect ethyl ether. Sino-auricular acceleration was the most characteristic effect. Blood-pressure studies indicate a slight and transitory fall, soon returning to normal unless the depth of anesthesia is increased.

CLINICAL EVALUATION[4, 11, 12, 13, 14, 15]

Clinical experience with vinyl ether (vinethene) covers its reported use in more than 35,800 cases during the years 1937-1941, about 50 per cent being in the field of dentistry. The following observations summarize the high points of this experience: Induction of anesthesia is rapid, requiring from one to two minutes. Excitement rarely occurs, but aberrant twitchings to running movements are seen in many cases. Excessive salivation is a frequent complication. Adequate muscular relaxation is usually present. Postanesthetic vomiting occurs in about 5 per cent of the cases, while, less frequently, convulsions may disturb the return to consciousness. Anoxemia rarely results during anesthesia of short duration. All anesthetists have noted that the maintenance of an even plane of anesthesia is considerably more difficult than with ethyl ether, owing to the high volatility and rapid elimination of vinyl ether. On the other hand, this is turned into a definite asset during the recovery period, which occurs rapidly, usually in from one to two minutes, the patient being able to walk unassisted in four or five minutes. It is of interest to the dentist that all reports indicate that neither the bleeding nor the clotting time is influenced by administration of vinyl ether.

USE OF VINYL ETHER IN DENTISTRY

The evaluation of any new inhalation anesthetic agent for use in dentistry involves a consideration of its advantages and disadvantages as against those of agents already in use. Therefore, it must be compared with nitrous oxide and ethyl chloride.

Comparison with Nitrous Oxide.—Vinyl ether is more potent than nitrous oxide. With its use, induction and recovery are more rapid. Its administration results in anesthesia without anox-

emia. Certain patients who prove to be resistant to nitrous oxide anesthesia can usually be anesthetized readily with vinyl ether.

Experienced anesthetists are of the opinion that vinyl ether is to be preferred over nitrous oxide in child cases. They were impressed with the ease of induction. They had noted the absence of cyanosis, the most objectionable feature of nitrous oxide analgesia.

In the advanced age groups, it appears that vinyl ether should be the drug of choice because it is in this group that anoxemia might be held responsible for the occasional serious accident incidental to nitrous oxide anesthesia. However, most reports dealing with the selection of vinyl ether as the anesthetic agent hedge, with a warning that " age, cardiovascular disease and renal insufficiency must be given due consideration in employing this agent." One suspects that this is righteous temerity, influenced by the feeling that experiences with this agent so far are "too good to be true," judging it on the basis of its great potency.

It is difficult to compare the hazards of vinyl ether with those of nitrous oxide mainly because the reports on these two agents at present represent their use by two different genera of anesthetists. Of approximately 250,000 case reports on vinyl ether, it is obvious that virtually all represent the work of experienced anesthetists; and, therefore, because the drug has not as yet fallen into the hands of the practicing dentist for an "occasional" trial, accidents would remain at an absolute minimum. On the other hand, our knowledge of the dangers of nitrous oxide are based on data accumulated from many millions of cases in the hands of anesthetists with all degrees of experience. Knowing the potency of vinyl ether, one wonders whether vinyl ether will fare as well in the hands of the average practicing dentist.

Comparison with Ethyl Chloride.— From the data available, it seems that vinyl ether is the better of the two drugs, and should supplant ethyl chloride in the pediatric extraction clinics. The "accumulative" depressing effect of ethyl chloride, and its tendency to produce spasm of the respiratory muscles, would seem to favor vinyl ether. However, such factors as salivation, nausea and vomiting and masseter spasm may determine the final choice between these two agents.

CONCLUSION

In view of the hazards inherent in the administration of such a potent anesthetic agent, it is advisable to restrict the use of vinyl ether in dental practice to persons well-trained in the administration of general anesthetics. Vinethene may be used in selected cases, but it is definitely contraindicated in patients with diseases of the liver. The dentist who has adequate experience in the use of nitrous oxide will need to have additional specific training in the administration of vinyl ether. The explosion hazard is about the same as that of ether. Vinethene is not the anesthetic of choice in high altitudes. Its usefulness is more limited than that of other anesthetics currently available to the dentist.

BIBLIOGRAPHY

1. GOODMAN, LOUIS, and GILMAN, ALFRED: Pharmacological Basis of Therapeutics. New York: Macmillan Co., 1941.

2. CUSHNY, A. R.: Pharmacology and Therapeutics. (Revised by C. W. Edmunds and J. A. Gunn.) Philadelphia: Lea and Febiger, 1940.

3. MARTIN, S. J., and ROVENSTINE, E. A.: Vinethene: Recent Laboratory and Clinical Evaluation. *Anesthesiology*, 2:285, 297, May 1941.

4. LUNDY, J. S.: Clinical Anesthesia. Philadelphia: W. B. Saunders Co., 1942.

5. GOLDSCHMIDT, SAMUEL, et al.: Divinyl Ether: Experimental and Clinical Studies. *J.A.M.A.*, 102:21, January 6, 1934.

6. GOLDSCHMIDT, SAMUEL, et al.: Anesthesia and Liver Damage: I. Protective Action of Oxygen Against Necrotizing Effect of Certain Anesthetics on Liver. *J. Pharmacol. & Exper. Therap.*, 59:1, January 1937.

7. LEAKE, C. D.; KNOEPEL, P. K., and GUEDEL, A. E.: Anesthetic Action of Divinyl

Oxide in Animals. *J. Pharmacol. & Exper. Therap.*, 47:5, January 1933.

8. BOURNE, WESLEY, and RAGINSKY, B. B.: Vinyl Ether (Vinethene) Anesthesia in Dogs. *Brit. J. Anes.*, 12:62, January 1935.

9. ORTH, O. S., et al.: Studies of Vinethene as Anesthetic Agent. *Anesthesiology*, 1:246, November 1940.

10. HAWK, M. H.; ORTH, O. S., and POHLE, F. J.: Hepatorenal Syndrome Following Administration of Vinethene. Case Report. *Anesthesiology*, 2:388, July 1941.

11. FELDMAN, M. H., and CARTIN, S.: Vinyl Ether (Vinethene) for Dental Surgery: Report on Experiences with 500 Cases. J.A.D.A., 25:616, April 1938.

12. DAKINS, C. J. M.: Divinyl Ether Anesthesia. *Brit. M. J.*, 1:1236, June 4, 1938.

13. CARTIN, S.: Scope and Utility of Vinethene Anesthesia in Dentistry and Oral Surgery. *Anes. & Anal.*, 18:324, November-December 1939.

14. FELDMAN, M. H., and CARTIN, S.: Administration and Use of Vinethene in Dentistry. *Anes. & Anal.*, 17:928, July-August 1938.

15. LYONS, S. S., and FRANK, H. P.: Vinethene Analgesia: Technic for Dental Extractions in Ambulatory Clinics. J.A.D.A., 26:580, April 1939.

(A complete list of references can be obtained from Martin and Rovenstine, Reference 3.)

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

DENTIFRICES*

Comfort Brand Tooth Powder: Composition: Each hundred grams is stated to contain precipitated calcium carbonate (Snow-Top Light), 74 gm.; sodium bicarbonate, 2 gm.; tricalcium phosphate (Victor), 15 gm.; neutral soap, 6.5 gm., and saccharin, essential oils, to make 100 gm.

Manufactured by Comfort Manufacturing Company, Chicago, Ill.

Craig-Martin Tooth Powder (Foamy Type): Composition: See Comfort Brand Tooth Powder (J.A.D.A., 30: 442, March 1943).

Manufactured and distributed by Comfort Manufacturing Company, Chicago, Ill.

Craig-Martin Tooth Powder (For Ration Kits): Composition: Each hundred grams is stated to contain sodium chloride, 50 gm.; sodium bicarbonate, 35 gm.; magnesium carbonate, 5 gm.; precipitated calcium carbonate (Snow Top, Light), 6 gm.; tricalcium phosphate (Victor), 4 gm.; oil of cloves, 0.5 gm.; and methyl salicylate, 0.5 gm.

Manufactured and distributed by Comfort Manufacturing Company, Chicago, Ill.

Tri-Basic Tooth Powder: Composition: Each hundred grams is stated to contain sodium bicarbonate, 17.86 gm.; sodium chloride, 49.15 gm.; tricalcium phosphate, 5.36 gm.; precipitated calcium carbonate (Snow Top Super-Light), 21.43 gm.; potassium chloride, 3.57 gm.; magnesium sulfate, 1.79 gm.; oil of cinnamon, 0.090 gm., and oil of clove, 0.064 gm.

Manufactured by the Royal Mfg. Co. of Duquesne, Chicago, Ill. Distributed by Acme Laboratories, Inc., Chicago, Ill.

Admission of a product to the list of Accepted Dental Remedies does not imply a recommendation. It means that the product and the methods by which it was marketed at the time of consideration were not found to be in violation of the Council's published rules. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics. All information is available upon request and inquiries are welcomed. A postal card will bring a prompt reply.

DONALD A. WALLACE, *Secretary*.

*A.D.R. Ed. 8, p. 102.

COMMITTEE ON ECONOMICS

A COMPARATIVE STUDY OF THE DENTAL NEEDS FOUND TO EXIST IN FOUR MAJOR GEOGRAPHIC SECTIONS OF THE UNITED STATES

IT will be recalled that the Committee on Economics of the American Dental Association made a study during May 1940 of the dental needs of adults in the United States. A section of the report of the findings of that study, based on reports of dental cases received from a group of dentists selected to represent the entire dental profession, was published in the September 1941 issue of THE JOURNAL. In all, reports were received on the dental needs of 3,383 males and 4,158 females. Because of difficulty in obtaining a representative sample among negroes, the study was limited to the white race. The distribution of these cases was compared with the distribution of the entire population with respect to geographic distribution, size of community in which residing and age distribution. The sample was found to be highly representative of the general population with respect to the first two conditions and appears to be representative with respect to the age distribution of the dental population. The sample of the dental population covered by the study is weighted more heavily in the age group under 50 years than is true of the general population. While the age distribution of the persons who make up what is referred to here as the "dental population" is not positively known, it is logical however to assume that the age group under 50 years visits the dentist more frequently than that section of the population over 50 years since the younger group retain a much higher percentage of natural teeth, thus requiring attention of the dentist more frequently.

Considerable interest has been shown in the findings of this study and several requests have been received for special tabulations of data not contained in the published report. One such request was that the average dental needs of the population of various sections of the United States be compared. It is the purpose of this report to present the findings of such a comparison.

It has long been assumed that there are marked differences in dental needs in various sections of the country. Unfortunately, few data have been available on which to base a comparison of the dental needs of a cross-section of the population of the major geographic divisions. Although the data collected by the Committee on Economics on the dental needs of adults have several shortcomings that limit their value in making sectional comparisons, the material does provide at least a rough measure of the relative need. Perhaps the chief limitation of the data results from the fact that, because of the method which it was necessary to utilize in collecting the information, the persons on whom reports were received were those who had actually gone to the dentist for treatment or examination during the period that the study was being made. Consequently, the sample does not adequately represent that large section of the population who never or seldom visit the dentist. This is especially unfortunate in the study since it appears probable, in the light of the unequal distribution of dentists with respect to population, that there are large sectional differences in the proportion of the population who visit the dentist with any regularity.

For the purpose of this study, the United States was divided into four major sections, which are referred to as the northeastern states, the southern states, the north central states and the western states. The states included in each section are shown in Figure 1. The data on dental needs received from the states in each of these four sections were compiled separately for males and females and broken down according to age.

This report is limited to a selected group of the more important items of dental need, which will serve as an index of total need. The items selected for study are fillings, extractions, partial dentures, full dentures and pyorrhea treatment. These items were selected because they are important and so

interrelated that a complete picture of the dental needs cannot be had without giving consideration to all of them. These data are presented in terms of the average needs and in terms of the percentage of persons needing various items of care. The tables give data on dental needs found among the residents of each of the four geographic sections. The graphs present several of the items of need, so that comparisons can be made at a glance of the needs prevailing in the four sections of the country. Because the number of cases available for analysis is relatively small, it was thought best to present fitted curves rather than to plot the original data. The curves, fitted by the method of least squares, not only facilitate the making of comparisons but also give a much more reliable picture of need, since they tend to minimize chance error within any one age group.

Fig. 1.—Four sections of United States covered in survey.

FILLINGS (FIGS. 2 AND 3)

Among the younger age groups, the most prevalent type of dental need is, of course, for fillings. Representing as it does the early stages in the development of dental disease, the need for fillings appears in a much higher percentage of the mouths of young adults than does the need for any other type of correction.

The average need for fillings among both men and women, through the entire age span 15-65, is considerably higher in the northeastern states than in any other section of the country. Among males, the average need is approximately 7.7 fillings for the age group 15-19. The average need declines with advancing years, reaching a level of 4.4 fillings at age 40-45, and continues downward to an average of 1.1 fillings needed at age 65-69. The need for fillings among females in this section of the country is very similar to the need among males. At age 15-19, the average female needs 7.6 fillings; at age 40-44, 4.3 fillings, and at age 65-69, 0.9 fillings.

In the southern, north central and western states, the average need for fillings is so similar that the slight differences are without significance. The pattern of the need for fillings among females residing in various sections of the country is almost identical to that of the males. For the age group 15-20, the need averages between 6 and 6.5 fillings per person for both males and females in the three sections of the country described above. Between the ages of 40 and 45, the need for fillings is approximately 3.5 per person. By the time age 65-70 is reached, the need for fillings becomes negligible, the average person needing approximately 0.5 fillings.

It will be noted that there exists at all age levels a wide variation in the need for fillings among the population of the northeastern states as compared with the need observed in all other sections. The widest variation occurs at the lowest age level, the average need being at least one filling greater in the northeastern states. With the advancing

years, this difference decreases, probably because of the cumulative loss of natural teeth with the resultant decrease in the possibility of development of caries. At age 65 and over, the average need in the northeastern states is approximately only 0.4 fillings greater than in the other sections.

The average need for fillings among the entire age group 15 years and over is interesting and significant. In some respects, it is more useful than the age specific rates that are discussed above, since it gives, in a single easily comprehensible figure, a summary of the need existing in the adult population of all ages. Since the age distribution of the dental patients included in this sample is not quite representative of the total population, it was necessary, in computing the average need for all age groups in the total population, to weight the age specific rates of need according to the age distribution of the total population as reported by the Federal Census. By this procedure, a weighted average for the various items of dental need was obtained that is representative of the total dental population. This average is reported in the "total" lines for males and females in Tables 1-4.

According to these weighted averages, males over 15 years of age residing in the northeastern states need 5.0 fillings. This section is followed by the western states, where the average need is 4.1 fillings for males. The average need in the southern states is 4.0 fillings, and in the north central

TABLE 1.—DENTAL NEEDS OF 861 MALES AND 1,074 FEMALES 15 YEARS OF AGE AND OVER, INCLUDED IN SAMPLE TAKEN IN NORTHEAST SECTION OF UNITED STATES*

Age	Number of Cases	Average Need		Percentage of Cases Needing:			
		Fillings	Extractions	Partial Dentures	Upper Full Dentures	Lower Full Dentures	Pyorrhea Therapy
Male	861	5.0	1.8	21.1	13.1	7.6	9.8
15 - 19	78	7.8	1.4	6.4	5.1	1.3	—
20 - 24	122	7.3	1.2	9.8	1.6	—	0.8
25 - 29	119	6.6	1.6	19.3	1.7	1.7	6.7
30 - 34	112	5.9	1.3	20.5	—	—	10.7
35 - 39	104	4.6	1.5	18.3	8.6	3.8	15.4
40 - 44	100	4.5	1.5	35.0	13.0	4.0	17.0
45 - 49	73	3.7	3.1	34.2	19.2	8.2	9.6
50 - 54	62	2.7	2.2	25.8	37.1	17.7	25.8
55 - 59	41	1.6	3.6	43.9	39.0	24.4	12.2
60 - 64	25	1.8	2.4	20.0	36.0	36.0	16.0
65 and over	25	1.9	1.2	20.0	24.0	20.0	8.0
Female	1,074	4.9	1.5	19.0	14.2	8.1	9.3
15 - 19	109	6.8	0.9	4.6	2.7	0.9	1.8
20 - 24	181	7.9	1.4	16.0	1.7	0.5	2.8
25 - 29	148	6.3	1.2	16.2	4.7	2.0	8.8
30 - 34	140	5.2	1.1	13.6	5.7	1.4	12.1
35 - 39	133	5.6	1.2	14.3	6.0	1.5	12.8
40 - 44	108	3.9	1.5	23.1	20.4	7.4	11.1
45 - 49	86	3.6	1.7	29.1	19.8	15.1	10.5
50 - 54	63	2.5	1.2	25.4	28.6	17.5	12.7
55 - 59	42	2.2	2.3	33.3	28.6	23.8	11.9
60 - 64	35	1.3	1.6	34.3	40.0	34.3	14.3
65 and over	29	1.5	3.0	27.6	41.4	20.7	13.8

*In Tables 1-4, the averages and percentages shown in the total lines were arrived at by applying the age specific rates for the various items of dental need shown to the age distribution of the entire adult population of the United States.

states, 3.9 fillings. Fillings needed by the average female over 15 years are but slightly less than the number needed by the average male. In the northeastern states, the need among females averages 4.9 fillings; in the western states, 4.4 fillings, and in both the southern and north central states, 3.8 fillings.

If data on other types of dental needs were not available, it probably would be concluded from the foregoing findings with regard to fillings that the level of dental health in the northeastern states is lower than in any other section of the country. This would hardly agree with the expectation, since it is well known that the population of the northeastern states have a relatively high economic status and have ready access to dental health facilities. Paradoxically, rather than indicating a low level of dental health, the high average need for fillings in this section actually indicates a relatively high level of dental health. This conclusion follows from the fact that a high average need for fillings is only possible when a relatively large number of teeth remain in the mouth. In an area having a high extraction rate, the need for fillings is correspondingly low. As will be seen later, this statement is borne out in this study by the relative need for extractions and partial and full dentures found to exist in other sections of the country. This finding lends support to a conclusion set forth in a paper by Henry Klein,[1] in which he concludes that the attack rate of caries is fairly constant among all sections of the population regardless of

TABLE 2.—DENTAL NEEDS OF 927 MALES AND 1,121 FEMALES 15 YEARS OF AGE AND OVER, INCLUDED IN SAMPLE TAKEN IN SOUTHERN SECTION OF UNITED STATES

Age	Number of Cases	Average Need		Percentage of Cases Needing:			
		Fillings	Extractions	Partial Dentures	Upper Full Dentures	Lower Full Dentures	Pyorrhea Therapy
Male	927	4.0	3.0	12.4	15.9	13.1	17.8
15 - 19	91	6.4	0.8	4.4	—	—	6.6
20 - 24	125	6.5	1.2	6.4	2.4	1.6	8.8
25 - 29	128	4.7	2.0	8.6	4.7	4.7	21.1
30 - 34	131	5.7	1.8	12.2	5.3	3.1	22.9
35 - 39	111	3.1	2.8	15.3	18.0	10.8	31.5
40 - 44	93	3.0	4.0	17.2	20.4	20.4	25.8
45 - 49	91	2.6	4.6	18.2	27.5	19.8	22.0
50 - 54	66	2.0	5.6	18.2	27.3	22.7	21.2
55 - 59	39	1.7	3.6	15.4	38.5	28.2	12.8
60 - 64	26	1.1	3.8	15.4	23.1	19.2	23.1
65 and over	26	1.6	6.0	15.4	42.3	42.3	3.8
Female	1,121	3.8	2.3	14.0	16.1	11.5	15.7
15 - 19	108	5.9	0.8	2.8	—	—	4.6
20 - 24	150	5.5	1.0	4.7	2.0	0.7	8.0
25 - 29	180	5.5	1.3	10.5	3.3	1.7	16.7
30 - 34	177	4.2	2.0	10.7	5.6	3.9	18.1
35 - 39	128	3.7	2.4	18.0	9.4	5.5	27.3
40 - 44	132	3.1	3.0	16.0	18.2	14.4	20.4
45 - 49	85	2.2	4.3	23.5	31.8	22.3	24.7
50 - 54	70	2.8	3.6	21.4	37.1	27.1	18.6
55 - 59	46	1.4	3.5	23.6	27.8	19.3	21.7
60 - 64	25	0.6	4.1	28.0	60.0	36.0	8.0
65 and over	20	0.9	3.5	20.0	40.0	35.0	10.0

1. KLEIN, HENRY: Tooth Mortality and Socio-Economic Status—Life Tables for Teeth. J.A.D.A., 30:80, January 1943.

differences in the care of the given teeth. In spite of the more or less universal attack rate of caries, the group who give better care to their teeth retain them longer through the prompt employment of restoratives. The close correlation between a high level of need for fillings and a low level of need for extractions and dentures would seem to bear out Klein's position, since it demonstrates that proper care does not necessarily greatly decrease the incidence of caries, but that it does tend to delay extraction.

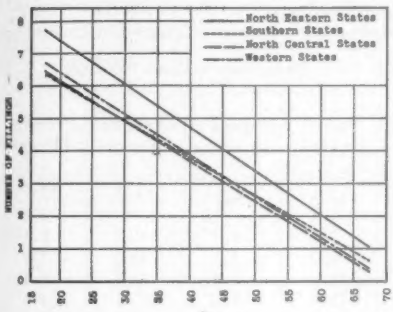


Fig. 2.—Comparison of average number of fillings needed by males 15 years of age and over residing in four sections of United States.

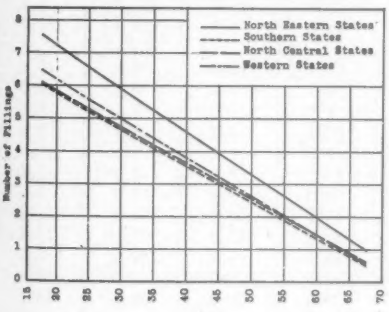


Fig. 3.—Comparison of average number of fillings needed by females 15 years of age and over residing in four sections of United States.

EXTRACTIONS (FIGS. 4 AND 5)

The need for extractions among men is strikingly lower through practically the entire age span for residents of the northeastern states. (Fig. 4.) The statements made above with regard to the relationship between the need for fillings and extractions are demonstrated by the fact that the order into which the various sections of the country fell with respect to need for fillings is reversed in the consideration of extractions.

In the northeast section of the country, the average male between the ages of 15 and 30 years has a prevalent need for approximately 1 extraction. Beyond 30 years of age, the need rises sharply, reaching a maximum of 3 extractions at the age of 55 years. Need for extractions begins to decline after the fifty-fifth year, reaching an average of 1.7 extractions for the man 65 years of age and

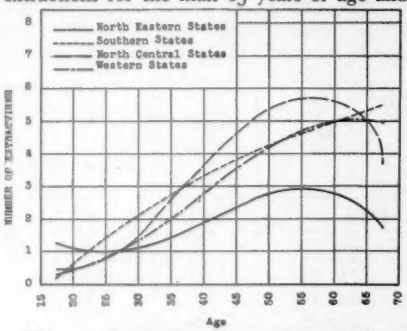


Fig. 4.—Comparison of number of extractions needed by males 15 years of age and over residing in four sections of United States.

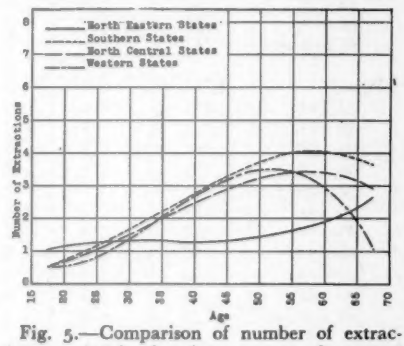


Fig. 5.—Comparison of number of extractions needed by females 15 years of age and over residing in four sections of United States.

over. Similarly to the male population, the females of the northeastern states also have a lower average need for extractions than is found among those of any other section of the country. In that section, the average need for extractions among females remains constant at slightly more than one extraction through the age span from 15 to 45 years. (Fig. 5.) Beyond 45 years of age, the need

for extractions shows a gradual rise, attaining a maximum of 2.6 extractions for those 65 years of age and over.

The average need for extractions among males in other sections of the country follows a pattern fairly similar to that observed for the northeastern states, except that the need for the various age groups is established at a much higher level. In these sections, the need for extractions among the age group 15-19 years is at a low level of about 0.5 extractions per person. Beyond that age, the need for extractions rises rapidly with advancing years. Up to the age of 30 years, the need is greatest in the southern states, while, above that age, the north central states show the greatest need by a considerable margin, rising to a maximum need of 5.7 extractions at about 55 years of age. Beyond 55 years of age, the need for extractions in this section declines, presumably since so many extractions were made in the younger age groups. The need for extractions among the upper age groups is quite similar in the southern and western states. Here, the need continues to increase throughout the age span, reaching a maximum at 65 years, with a need for 5.0 extractions for the western states and 5.5 extractions for the southern states.

TABLE 3.—DENTAL NEEDS OF 1,113 MALES AND 1,327 FEMALES 15 YEARS OF AGE AND OVER, INCLUDED IN SAMPLE TAKEN IN NORTH CENTRAL SECTION OF UNITED STATES

Age	Number of Cases	Average Need		Percentage of Cases Needing:			
		Fillings	Extractions	Partial Dentures	Upper Full Dentures	Lower Full Dentures	Pyorrhea Therapy
Male	1,113	3.9	2.9	13.4	18.9	14.3	10.3
15 - 19	110	6.8	0.9	3.6	—	—	1.8
20 - 24	157	5.9	1.1	7.0	1.9	0.6	8.3
25 - 29	141	5.8	1.3	9.2	3.5	0.7	7.8
30 - 34	127	4.8	2.2	15.0	9.4	0.8	9.4
35 - 39	132	3.3	2.9	18.9	18.2	15.1	14.4
40 - 44	111	3.2	3.1	18.0	18.9	15.3	17.1
45 - 49	121	2.1	6.2	16.5	28.1	23.1	14.0
50 - 54	64	1.7	5.4	14.1	43.7	37.5	21.9
55 - 59	73	1.3	6.0	16.4	46.6	32.9	6.8
60 - 64	35	0.7	3.8	11.4	45.7	45.7	5.7
65 and over	42	1.6	3.5	26.2	45.2	33.3	9.5
Female	1,327	3.8	2.0	17.7	16.4	9.8	11.2
15 - 19	155	6.4	0.6	4.5	0.6	0.6	3.2
20 - 24	201	5.8	1.1	8.5	2.0	0.5	7.5
25 - 29	187	4.8	1.2	10.2	3.2	2.1	9.1
30 - 34	179	4.3	2.0	11.7	6.1	5.0	10.6
35 - 39	153	3.3	2.5	28.1	11.8	3.3	13.7
40 - 44	125	2.7	2.3	24.0	17.6	12.8	9.6
45 - 49	114	2.9	3.1	30.2	26.6	18.6	11.5
50 - 54	96	2.1	3.2	20.8	33.3	25.0	15.6
55 - 59	53	2.2	2.6	26.4	41.5	18.9	7.5
60 - 64	36	1.2	4.3	30.5	41.7	22.2	50.0
65 and over	28	0.3	2.6	25.0	50.0	28.6	10.7

As with the need for fillings, the really striking difference in the need for extractions lies between the need in the northeastern states and the need in all other sections. Beyond 55 years of age, the need for extractions is almost twice as great in other sections as in the northeastern states.

Among women also, there is found to be a wide disparity in the existing need for extractions in the northeastern states and in

other sections of the country. Up to the age of 30 years, sectional differences in need are slight, but, beyond that age level, the need for extractions rises much more rapidly in the southern, western and north central states than in the northeastern states. Around ages 50-55, need in the northeastern states is scarcely half as great as in other sections.

Comparison of the average number of extractions needed among all age groups brings out sharply the sectional differences. Among adult males residing in the northeastern

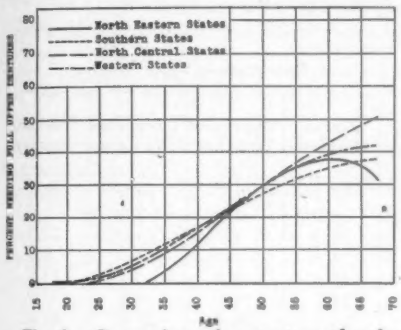


Fig. 6.—Comparison of percentage of males 15 years of age and over needing upper full dentures, in four sections of United States.

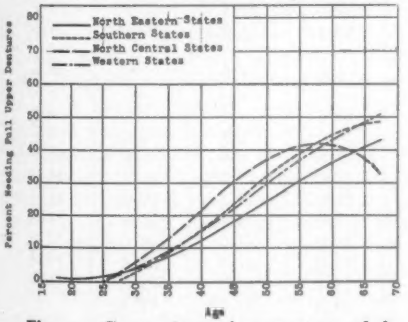


Fig. 7.—Comparison of percentage of females 15 years of age and over needing upper full dentures, in four sections of United States.

states, 1.8 extractions are needed as compared with 3.0 extractions in the southern states, 2.9 in the north central states and 2.4 in the western states. Among females, the sectional differences are proportionately as great, the average need being 1.5 extractions in the northeastern states, 2.3 in the southern states, 2.0 in the north central states and 1.9 in the western states.

FULL DENTURES—UPPER AND LOWER
(FIGS. 6-9)

Up to this point, the discussion of dental needs has been in terms of the average need of an individual. In dealing with items of which a person might need more than one, such as fillings and extractions, an average figure is fairly realistic. However, in discussing the need for upper full or lower full dentures, items of which there can be need for no more than one, it is hardly realistic

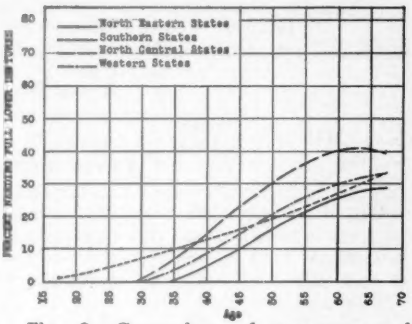


Fig. 8.—Comparison of percentages of males 15 years of age and over needing lower full dentures, in four sections of United States.

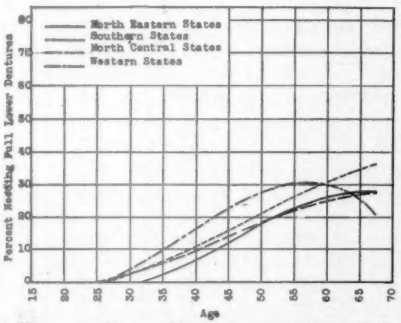


Fig. 9.—Comparison of percentage of females 15 years of age and over needing lower full dentures, in four sections of United States.

to speak of an average need; for example, an average need of 0.5 upper dentures per person. Hence, these items are presented in terms of the percentage of persons needing dentures.

As would be expected, the need for upper full dentures is negligible until the age of 25 or 30 years is reached. Beyond that age, the need increases rapidly. By the time age

30-44 years is reached, approximately 25 per cent of all dental patients need upper full dentures. The maximum need is reached with the percentage of persons requiring full dentures ranging between 38 and 50 per cent in the four sections of the country. Among men of all age groups, upper full dentures are needed by 13.1 per cent in the northeastern states, 15.9 per cent in the southern states, 18.9 per cent in the north central states and 17.7 per cent in the western states. Similarly, 14.2 per cent of all women in the northeastern states need full dentures, 16.1 per cent in the southern states, 16.4 per cent in the north central states and 17.0 per cent in the western states.

The need for lower full dentures generally develops at a somewhat later age than is true of upper full dentures. For most sections of the country, the need for lower dentures is negligible until 35 years of age is reached. After that age, the need rises sharply. Between the ages of 40 and 44, approximately 15 per cent of all men and a somewhat smaller percentage of women need lower full dentures. The maximum need is reached in most instances after the age of 65 years, at which age level approximately 30 to 40 per cent of all dental patients require dentures. It is evident that the need for lower dentures is never so great as the need for upper dentures. Greater variation is observed in the need for lower dentures in the various sections of the country than was the case with the need for upper dentures. Among men residing in the southern states, the need for lower full dentures arises at an earlier age than is the case in other sections. However, the need arises rather gradually with increasing age in this section; and beyond 45 years

TABLE 4.—DENTAL NEEDS OF 344 MALES AND 429 FEMALES 15 YEARS OF AGE AND OVER, INCLUDED IN SAMPLE TAKEN IN WESTERN SECTION OF UNITED STATES

Age	Number of Cases	Average Need		Percentage of Cases Needing:			
		Fillings	Extractions	Partial Dentures	Upper Full Dentures	Lower Full Dentures	Pyorrhea Therapy
Male	344	4.1	2.4	15.7	17.7	10.0	15.5
15 - 19	34	7.3	0.6	2.9	2.9	2.9	2.9
20 - 24	46	6.0	0.5	6.5	—	—	17.3
25 - 29	45	5.6	0.8	4.4	—	—	6.6
30 - 34	37	5.5	2.4	21.6	8.1	—	13.5
35 - 39	33	3.4	2.8	15.2	15.1	6.0	33.3
40 - 44	45	2.0	4.5	11.1	24.4	22.2	28.8
45 - 49	36	1.8	2.8	25.0	25.0	11.1	16.6
50 - 54	31	1.4	1.9	25.8	38.7	22.5	19.3
55 - 59	17	4.6	3.4	17.6	23.5	5.8	11.7
60 - 64	8	0.3	10.7	37.5	87.5	62.5	12.5
65 and over	12	0.9	2.1	33.3	33.3	16.6	8.3
Female	429	4.4	1.9	15.0	17.0	12.2	10.6
15 - 19	42	7.3	0.6	—	—	—	7.1
20 - 24	60	7.2	1.5	10.0	1.7	1.7	6.7
25 - 29	73	5.2	0.9	4.1	5.5	4.1	9.6
30 - 34	61	3.8	2.1	18.0	9.8	9.8	11.5
35 - 39	59	3.3	1.9	22.0	13.6	10.2	15.2
40 - 44	42	3.1	3.4	23.8	33.3	19.0	11.9
45 - 49	28	2.0	2.8	17.9	28.6	25.0	17.9
50 - 54	25	1.5	3.0	24.0	32.0	20.0	12.0
55 - 59	19	1.4	4.6	21.0	47.4	36.8	15.8
60 - 64	12	1.0	1.7	16.7	41.7	33.3	16.7
65 and over	8	2.6	0.6	25.0	25.0	12.5	—

of age, the need in both the north central and western states is found to exceed that in the south. The need for lower dentures among women is found to be greater in the western states than in other sections up to the age of 60 years, after which the need for dentures drops below the need existing in other sections.

Lower full dentures are needed by 7.6 per cent of all men in the northeastern states, 13.1 per cent in the southern states, 14.3 per cent in the north central states and 10.0 per cent in the western states. Among women, full lower dentures are needed by 8.1 per cent of those residing in the northeastern states, 11.5 per cent in the southern states, 9.8 per cent in the north central states and 12.2 per cent in the western states.

There is less variation in the need for full dentures, both upper and lower, in the various sections of the country than was the case with fillings and extractions. However, it is found consistently, among both men and women, that the need for upper and lower dentures is less at almost every age level among the residents of the northeastern states than the need among residents of other sections of the country.

PARTIAL DENTURES

While the need for partial dentures at various age levels will not be discussed, it is interesting to examine the relative percentage of all males and females 15 years of age and over who need partial dentures. Of the men residing in the northeastern states, 21.1 per cent need partial dentures. In the southern states, 12.4 per cent need partial dentures; in the north central states, 13.4 per cent, and in the western states, 15.0 per cent. Similarly, 19.0 per cent of women in the northeastern states, 14.0 per cent in the southern states, 17.7 per cent in the north central states and 15 per cent in the western states need partial dentures.

For both males and females, it will be observed, the percentage of persons needing partial dentures is greatest in the northeastern states. This may seem contradictory in the light of the observations just made with regard to extractions and upper and lower full dentures, since, in every case, these needs were found to be lower in the northeastern states. The explanation of this seeming paradox is the same as that given for the greater need for fillings observed in that section of the country. Actually, the greater need for partial dentures is indicative of a higher level of dental health. Some natural teeth must remain in the mouth if a partial denture is to be placed. Thus, the higher percentage of persons in the northeastern states needing partial dentures probably indicates that a larger percentage of persons in this area have enough natural teeth remaining to make the placing of a partial denture practicable. This is borne out by the fact that, in other sections of the country, a larger percentage must resort to full dentures.

PYORRHEA

While there are other items of dental need that could be discussed, attention will be directed to but one more type of dental condition, pyorrhea. Pyorrhea is prevalent through the entire age span of 15 to 65 years and over, and the attack rate is very similar for men and women. The attack rate is low up to 25 years of age, but rises quickly thereafter and maintains a high and relatively constant average until the loss of teeth, associated with increasing age, tends to cut down slightly the attack rate.

A comparison of the pyorrhea rates prevailing in the four sections of the country under study shows the usual pattern. The average rate for all ages is lower for both men and women in the northeastern states than in any other section. Among men, the rates are as follows: In the northeastern states, 9.8 per cent of cases are diagnosed as pyorrhea; in the southern states, 17.8 per cent; in the north central states, 10.3 per cent, and in the western states, 15.5 per cent. Among women, the rates are as follows: In the northeastern states, 9.3 per cent of cases are diagnosed as pyorrhea; in the southern states, 15.7 per cent; in the north central states, 11.2 per cent, and in the western states, 10.6 per cent. It will be noted that in the southern states, the rates are strikingly high for both men and women.

CONCLUSIONS

In the review of the need for various items of dental care as found in four sections of the United States, the one thing that stands out sharply is the fact that dental health is on a considerably higher level in the

northeastern states than in any other section of the country. In this section, the need for extractions and upper and lower full dentures, and for the treatment of pyorrhea, is in every instance less than in other sections, while the need for fillings and partial dentures (indicative of a high percentage of natural teeth retained in the mouth) is higher than in any other section. That these differences are not the result of chance is amply demonstrated by the fact that the differences observed are uniform in men and women.

It is not surprising to find that the level of dental health is relatively high in the northeastern states. It is rather unexpected, however, that the differences would prove negligible among the levels of dental health in the southern, north central and western states. It is generally supposed that because of the low economic status of a large percentage of the population in the southern states, dental health is on a lower level there than in other sections of the country. However, the findings of this study seem, on the surface, not to bear this out.

Analysis of the economic status of the dental patient reported in the survey shows that only 61 per cent of patients in the northeastern states had incomes below $2,000, as compared with 69 per cent in the north central states, 71 per cent in the western states and 74 per cent in the southern states. It has been clearly demonstrated in other sections of the study of dental needs among adults that there is a close correlation between economic status and dental needs. Hence, the relatively high economic level of the dental patients in the northeastern states may help to explain the superior dental health of this group. Differences in economic status of persons reported on from the north central, southern and western states are small. Correspondingly, the differences in dental needs among the population in these three sections is small. It should be kept in mind that the persons reported on in this study visited the dentist during the period in which the survey was being made. It may well be that an unduly large percentage of the population in the southern states seldom or never visit the dentist. If this is true, the data may have failed to bring out the actual extent of the dental health problem in this section.

Conceivably, the availability of dental health facilities may be a factor in dental health in the various sections. In the northeastern states, there is one dentist to every 1,358 persons; in the southern states, one dentist to every 3,201 persons; in the north central states, one dentist to every 1,487 persons, and in the western states, one dentist to every 1,327 persons. While the ratio of dentists to population is practically the same in the north central, western and northeastern states, the distances that patients are likely to have to travel to reach a dentist are probably much less on the average in the northeastern states than in the other states. This question of distances that patients travel to reach a dentist is related to the question of the distribution of the population in rural and non-rural areas. Information is not available as to the distribution according to rural and non-rural residence for the dental patients reported on in the study. However, from census data, it is found that 58 per cent of the population of the north central states live in rural areas, 34 per cent in the western states, 32 per cent in the southern states and only 19 per cent in the northeastern states. It is suggested that the relatively high percentage of city dwellers in the northeastern states, coupled with a relatively high economic status, may help to account for the fact that dental health in this section is better than in other sections.

From the work of H. Trendley Dean and his associates in the United States Public Health Service, it has been established that in areas having a water supply containing fluorine, the caries rate is very low. There are no controls available in this study to make it possible to distinguish between patients reported on who have access to a water supply with a fluorine content and those who do not. On the other hand, it may be pointed out that the water supplies reported on by the United States Public Health Service as having a fluoride content are predominantly in the southern states. It is conceivable that this fact may have a part in keeping dental needs in this area lower than might be expected in view of the low economic status of the population and the scarcity of dentists in the southern states.

COMMITTEE ON DENTAL MUSEUM AND DENTAL REGISTRY

THE REGISTRY OF DENTAL AND ORAL PATHOLOGY

DURING the past several months, the Registry has noted a sharp increase in the number of specimens being forwarded for histologic examination. This is undoubtedly due to a better general understanding of the Registry services. Many persons are learning for the first time of the services that are available through the Registry and the Army Medical Museum and are apparently using them as an aid to the diagnosis and better understanding of oral lesions.

It has been necessary, in the interest of the defense program, for the Registry to refuse a number of invitations to install exhibits at various state meetings. It has been and still is the policy to accept such invitations whenever possible in order to utilize every means of publicizing the Registry program. Lack of time for the adequate preparation of exhibits has been the chief consideration.

THE LOAN SETS OF DENTAL AND ORAL PATHOLOGY

During the past few months, the number of loan sets sent out to civilian practitioners has increased considerably. In connection with the original proposal to include periodically those cases of unusual interest in the loan set, it has been necessary to assemble the sets at the Registry headquarters for revision. It is the plan to revise the sets completely, increasing the present number of sixty-two cases to approximately 100 and to illustrate all of the cases more adequately. In addition, a part of the cases will be devoted to the histology of the dental structures.

During this period of revision, it may be necessary occasionally to delay action on requests for these sets. If possible, a number of the sets will be constantly available so that complete interruption of the program will not be necessary. A number of dental schools have been using these sets in sufficient numbers to permit their use as an aid in the undergraduate teaching of pathology. We are glad to make minor alterations in the loan period in order that this may be possible. We wish to emphasize that a certain number of these sets will continue to be available on direct application to the Curator, Army Medical Museum, Washington, D. C., enclosing the $25 deposit, which will be returned when the study of the set has been completed.

ATLAS OF DENTAL AND ORAL PATHOLOGY

Facilities being available to produce the Atlas at a substantial reduction in cost and in larger quantities, the Registry has undertaken the preparation of the second edition. While it will not be necessary to make many changes in the first edition, cases of unusual interest will be added and the material will be arranged, with the inclusion of cases illustrating the histology of the dental structures. A few copies of the first edition are still available. It is hoped that the second edition will be completed shortly. The atlas provides a handy means for the busy clinician to review the basic principles of dental and oral pathology. It is important to remember that many of the details of pathologic processes are not included in the undergraduate training of the professional man. If he is to be progressive, it is important that a reasonable amount of time be devoted to the study of such changes, in order to augment the some-

what sketchy background provided in his undergraduate training. We sincerely believe that the time and effort expended in such study will provide much satisfaction in the ability to interpret better the clinical picture and to rationalize the treatment. There is no question that the professional standard of clinicians is based on knowledge of the basic sciences and that knowledge of pathology ranks high in this list of requirements.

STATE BOARD MATERIAL

The state board booklets continue to be a popular undertaking of the Registry. With the spring examinations in the offing, several boards have indicated their desire to adopt this program. Those boards that have been using the material continue to report complete satisfaction with the results obtained. We wish again to call the attention of all state board examiners to the availability of the material in booklet form. The secretaries of all of the state examining boards are being contacted directly from the Registry office by letter, again reminding them of this program. It is hoped that they will call this to the attention of the other members of their board and take appropriate action. Those interested should write direct to the Curator, Army Medical Museum, Washington, D. C., for further information.

COMMITTEE OF CONSULTANTS

Of particular satisfaction has been the response of the Committee of Consultants who have now had the opportunity to review three groups of cases.* The degree of agreement in diagnoses between the board members and the Registry office has been somewhat unusual. With the exception of minor differences in nomenclature, the percentage of agreement has been unusually high. In this connection, the Registry has adopted a nomenclature best suited to the needs of the clinician, and only after an exhaustive study and interchange of cases between the other registries functioning at the Army Medical Museum. We believe that the establishment of the Committee of Consultants has resulted in an opportunity for certain teaching institutions to become familiar with the character of the material being received by the Registry. It has been possible, in some instances, to provide material for inclusion in the teaching files of certain dental schools. This, of course, is in keeping with the program of dissemination of material for teaching purposes. When, in the opinion of the Registry staff, it is necessary, the diagnoses of the consulting pathologists have been forwarded to the contributor. A number of interesting cases have been received and circulated among members of the Committee of Consultants. In order to report briefly the character of this material and to show how the Committee of Consultants has functioned, a few of these cases will be reviewed.

*This committee consists of Kurt H. Thoma, Harvard University; Lester R. Cahn, Columbia University; Balint Orban, Chicago College of Dental Surgery, and Hamilton B. G. Robinson, Washington University.

REPORT OF CASES

CASE 1.—*History.*—A colored man, aged 30, who had been struck a glancing blow on the left side of the mandible, sought medical attention because of a loose tooth in the vicinity of the injury. At that time, the first and second molars of the left side were loose; but since a considerable degree of epithelial hyperplasia existed, no operation was attempted. The patient was not seen until four months later, at which time he stated that he had pulled one of the teeth with his fingers. He was again examined and referred for treatment.

Examination.—The involved area covered the region and extended onto the cheek. The area was 1.5 by 2 cm. The entire periphery of the mass was ink black. Beneath the angle of the jaw, there was a nodule roughly ovoid and measuring about 12 by 22 cm. Aspiration biopsy of this nodule revealed pigmented fluid and tissue.

The lesion was removed. The material from the case was forwarded to the Registry for examination.

Microscopic Examination.—An extremely cellular lesion was revealed in which irregular areas containing large clear cells with a faintly clear cytoplasm could be seen. These were interpreted as being similar to nevus cells. Many melanoblasts were in evidence. Alterations of cell structure resulting in many bizarre forms were noted. Mitotic figures were fairly numerous. There was considerable pigment present, most of it being contained within the melanoblasts and melanophores. Vascularity was a feature, the vessels being of sarcomatous type.

Registry Diagnosis.—The diagnosis was malignant melanoma.

This case was circulated and the following opinions were received: Kurt H. Thoma, melanoma; Lester R. Cahn, malignant melanoma; Balint Orban, malignant melanoma; Hamilton B. G. Robinson, melanoma.

CASE 2.—*History.*—A white woman, age not stated, yielded a specimen from the upper lip, left side. The clinical diagnosis was mole. The Wassermann reaction was negative. The entire lesion was removed. The material from the case was forwarded to the Registry for examination.

Microscopic Examination.—The irregular section of skin contained numerous masses of deeply staining epithelial cells extending well into the subcutaneous tissue. The tumor cells were predominantly basal and showed little central cystic degeneration. There were occasional bizarre forms. Mitotic figures were fairly numerous. The lesion suggested a possible hair-follicle origin.

Registry Diagnosis.—The diagnosis was basal-cell carcinoma of the upper lip. This case was circulated, and the following opinions were received: Kurt H. Thoma, Lester R. Cahn, Balint Orban, Hamilton B. G. Robinson, basal-cell carcinoma.

CASE 3.—*History.*—A white man, aged 58, presented a large area of ulceration in the right tonsillar region extending onto the tongue. This lesion was of one and a half months' duration. The Wassermann reaction was negative. No other history was submitted. The material from the case was forwarded to the Registry for examination.

Microscopic Examination.—Examination revealed one large section and two smaller sections of tumor tissue. The central portion of the larger section contained some mucous acini, together with an area of diffuse chronic inflammatory reaction. The surface was covered by stratified squamous epithelium, which had invaded the underlying tissue in ramifying cords and strands. There was considerable variation in the cell size and staining characteristics. The basal layer, for the most part, was not discernible. Mitotic figures were only occasionally noted. Epithelial pearls could be seen.

Registry Diagnosis.—The diagnosis was epidermoid carcinoma. The case was circulated and the following opinions received: Kurt H. Thoma, epidermoid carcinoma, grade III; Lester R. Cahn, Balint Orban, Hamilton B. G. Robinson, epidermoid carcinoma.

These cases represent only a few of the more than 200 cases that have been received by the Registry since the first of the year. They do indicate, however, the character of the material being received. Both the chairman and the secretary of the Museum Committee desire to express their satisfaction with the whole-hearted cooperation of the members of the Committee of Consultants.

JOSEPH L. BERNIER,
Secretary and Pathologist to the Registry

AMERICAN REGISTRY OF PATHOLOGY
REGISTRY OF DENTAL AND ORAL PATHOLOGY

As early as 1895, the importance of scientific dental research was officially recognized by the founders of the American Dental Association. In that year, the national convention expressed themselves on this subject as follows:

Resolved, that this Association formally adopt the Army Medical Museum and Library as the National Museum and Library of the dental profession of the United States.

During the succeeding years, your Museum Committee and a few interested individuals collected at the Museum a fairly representative but limited exhibit

of historic instruments, models and specimens, together with data on scientific methods. Some detailed studies have been conducted and, in recent years several exhibits have been presented at various state and national meetings which aroused the active interest of the Association in this project.

In 1933, at the annual convention of the Association, in Chicago, a resolution was adopted establishing a registry of dental and oral pathology. The registry was placed under the direction of the Committee on the National Museum of Dentistry.

This action was taken with the approval of the Division of Medical Sciences of the National Research Council, which had already established the American Registry of Pathology at the Army Medical Museum. Therefore, the Registry of Dental and Oral Pathology became an integral part of this Registry of Pathology, together with the already functioning units; namely, the Registry of Ophthalmic Pathology, Lymphatic Tumor Registry, Bladder Tumor Registry, Registry of Otolaryngologic Pathology, Registry of Dermal Pathology, Tumor Registry and Kidney Tumor Registry.

The Museum Committee intends to conduct this project along the following general lines:

1. To organize a division of the Registry for each branch of dentistry which will benefit by such a service.

2. To collect material from, and compile data appertaining to, the pathologic disturbances of the hard and soft tissues of the oral cavity. A file will be kept of all such material, including gross and microscopic specimens, photographs, roentgenograms and case histories. All cases of definite or suspected malignancy, as well as those of unusual interest, will be followed by annual inquiry addressed to the contributor for a period of five years.

3. To furnish consultation service in the histopathology of difficult cases to any member of the American Dental Association. Each branch of dentistry will be requested to name two authorities who will serve as consultants in addition to the pathologists on duty at the Army Medical Museum. It is not intended to conduct a diagnostic center in competition with local pathologists, as consultation service will be afforded only in such cases as cannot be diagnosed locally.

4. To prepare loan collections consisting of microscopic preparations, photographs or lantern slides of illustrative cases, for use by dental schools, societies and study clubs whose members are affiliated with the American Dental Association.

5. To add to the Museum collection so that an exchange service may be maintained for the benefit of institutions interested in Museum activities. It is the desire of the committee to enlarge and modernize the dental exhibit so that it will be of interest, educational value and historic record second to none.

There are many exhibits shown at district, state and national meetings which are discarded after they have served their brief purpose. It is intended to obtain the more valuable of these collections for permanent display or file in the Dental Section of the Army Medical Museum. Credit will be given to the donor of each exhibit whenever it is displayed.

Requests for further information relative to the functioning of the Registry or concerning the Dental Section of the Museum should be addressed to:

The Curator
Army Medical Museum
War Department
Washington, D. C.

The number of cases on file in the Registry of Dental and Oral Pathology as of May 15, 1939, was 808 classified as follows:

Carcinoma (all types)	241
Sarcoma (all types)	11

Angioma (all types)	27
Adamantinoma (all types)	12
Papilloma	37
Fibroma (all types, including epulis)	69
Lipoma	3
Osteoma	8
Myeloma	1
Adenoma	3
Mixed tumors	18
Myoma	2
Myoblastoma	1
Melanoma	2
Neuronoma	1
Giant cell tumor	7
Osteitis fibrosa cystica	3
Odontome	3
Exostosis	4
Leukoplakia	26
Cysts:	
Antrum	1
Branchial	1
Dentigerous	10
Dermoid	1
Follicular	1
Lymphatic	1
Maxillary (median)	4
Parotid gland	2
Radicular	60
Retention (mucous)	19
Sebaceous	1
Thyroglossal duct	1
Teratoma	2
Osteomyelitis	10
Actinomycosis	1
Myositis ossificans	1
Cleft palate and harelip	1
Hutchinson's teeth	1
Ranula	2
Molluscum contagiosum	1
Granuloma pyogenicum	3
Scurvy	2
Noma (cancrum oris)	2
Keloid	1
Hyperkeratosis	13
Seborrheic keratosis	1
Granuloma, coccidoidal	1
Tuberculosis (oral lesions)	3
Diffuse atrophy of jaws	1
Ectopic salivary gland	1
Mickulicz's disease	1
Vitamin deficiency (original research)	1
Dietary deficiency (original research)	1
Neonatal lines (original research)	1
Results of surgical pyorrhea (original research)	1
Pyorrhea alveolaris	12
Miscellaneous	178
Total	822

The difference between the abovementioned total and the total number of cases in the Registry is due to the fact that fourteen cases show more than one important pathologic condition. The cases listed as miscellaneous include the common dental diseases, such as caries of enamel and dentin, diseases of the pulp and diseases of the investing structures of the teeth.

This is presented to show the variety of pathologic lesions of the oral cavity and adjacent parts in the Registry and also to indicate the type of material that contributors are requested to send in.

HENRY A. SWANSON, *Chairman,*
Committee on Dental Museum
and Dental Registry,
1726 Eye St., N.W.,
Washington, D. C.

CORRECTION

IN the article "Hot Solutions of the Sulfonamides," by Fred R. Adams, published in the January 1, 1943 issue of THE JOURNAL, on page 63, Table I, the first two tabulations should have had minus signs instead of plus signs as follows:

Sulfanilamide in distilled water	6% plus 140°	60 seconds — — — —
Sulfanilamide in distilled water	6% plus 140°	10 seconds — — — —

COMMITTEE ON LEGISLATION

INCOME TAX DEDUCTIONS FOR DENTAL AND MEDICAL EXPENSES

THE section of the income tax law providing a deduction for dental and medical expenses was printed in full in the November 1942 Mid-Monthly issue of THE JOURNAL. There is some confusion regarding this provision, however, especially in the minds of the public. It seems that some people are under the impression that they can deduct dental and medical expenses in full, while others think that they can deduct all of their expenses in excess of 5 per cent of their net income.

It is to be noted that in order to be deductible, such expenses must be in excess of 5 per cent of the taxpayer's net income computed before a deduction for health expenses and the expenses must have been paid during the taxable year. The following example illustrates this deduction. The term net income, of course, means gross income, such as salary and other income less the deductions allowed by the tax law, such as business expenses and taxes paid.

Net income		$5,000
Dental and medical expenses	$1,000	
5% of net income	250	
Allowable deduction		750
Net reportable income		$4,250

The law provides that the deduction can be made for expenses paid during the taxable year and is silent as to when the expenses were incurred. Thus, if the entire $1,000 of expenses is paid for in full during the taxable year, the taxpayer may deduct $750 from his net income, leaving a net taxable income of $4,250. On the other hand, in the same case, if the taxpayer incurred the same total expense during the taxable year 1942 and paid half of this total bill in that year and promised to pay the other half during the year 1943, the amount actually paid for dental and medical expenses during the taxable year of 1942 would be $500; which would permit him to deduct only $250 from his net income, leaving a net taxable income of $4,750. If it is assumed that, for the following year, his net income was exactly the same as for the preceding year, that there were no additional expenses and that he paid the balance due on the previous year's bill of $500, then for the following year he could again deduct $250. Thus, in this case, if he pays his bill in full during the taxable year, he can deduct $750, but if he divides it into two annual payments of $500 each, he can deduct a total of only $500, and that over a period of two years. In the second year, if he has any additional dental and medical expenses and pays for them in that year, they will, of course, be deductible because he has already exceeded his 5 per cent limitation. Since the allowable deduction is based on the excess of expenses over 5 per cent of his net income, therefore, in the foregoing example, if his net income for 1943 decreased, it would automatically increase his allowable deduction, and if it increased, his allowable deduction would automatically decrease.

The taxpayer should also remember that all dental and medical expenses which are compensated for by insurance or otherwise are not deductible and may not be used in the foregoing calculations. The act specifically provides that the term "medical care" shall include amounts paid for the diagnosis, cure, mitigation, treatment or prevention of disease, or for the purpose of affecting any structure or function of the body, including amounts paid for accident or health insurance. Hence, all amounts paid out

during the taxable year for any of the foregoing items should be included in the total deduction for dental and medical expenses.

To summarize, there are five rules regarding the deduction for dental and medical expenses:

1. The total expense must be in excess of 5 per cent of the taxpayer's net income, computed without the benefit of this deduction for dental and medical expenses.

2. The total expense must have been paid during the taxable year.

3. The total expense must be for the taxpayer, his spouse or a dependent.

4. The total expense must *not* have been compensated for by insurance or otherwise.

5. The deduction claimed must *not* exceed $1,250 for a single person; or $2,500 for the head of the family, or $2,500 for a husband and wife who file a joint return.

RESEARCH COMMISSION

MIDYEAR REPORT OF THE RESEARCH COMMISSION OF THE AMERICAN DENTAL ASSOCIATION FEBRUARY 1943

LIKE all other organizations and individuals in the United States, the Research Commission is devoting all of its energies to the war effort.

Shortly after the St. Louis meeting, the Commission offered all of its facilities at the National Bureau of Standards to the director of the bureau for any work that he thought would be valuable to their war plans. A copy of the correspondence between the Commission and the director follows.

October 14, 1942

Dr. Lyman J. Briggs, Director
National Bureau of Standards
Washington, D. C.

Dear Doctor Briggs:

The Executive Board of the Research Commission of the American Dental Association has authorized me to offer to you, as director of the National Bureau of Standards, the service of our two fellowship men, Mr. Beall and Mr. Caul, together with any part of our appropriation, for any essential war work which, in your opinion, is of value to our country. The Commission realizes that, during times like these, the active and wholehearted cooperation of scientific organizations, such as the American Dental Association, can do much to aid our country in its all-out effort to defeat the Axis.

The American Dental Association would consider it a distinct honor if you were to take advantage of this offer at an early date.

Sincerely yours,
DANIEL F. LYNCH,
Secretary.

October 17, 1942

Dr. Daniel F. Lynch, Secretary
Research Commission
American Dental Association
1678 Primrose Road, N. W.
Washington, D. C.

Subject: Messrs. Caul and Beall

Dear Doctor Lynch:

I thank you for your letter of October 14, offering the service of two fellowship men to assist in essential war work which would be of value to the country in the present emergency.

In compliance with your generous offer, we are transferring Mr. Caul to a confidential project for the War Department in the Metal and Ore Analysis Section of our Chemistry Division. It will, however, be necessary to retain Mr. Beall on his present work with Dr. Souder.

Please be assured that the Bureau appreciates this patriotic move on the part of the Association.

Sincerely yours,
LYMAN J. BRIGGS, *Director*

FELLOWSHIP IN PHYSICAL PROPERTIES OF DENTAL MATERIALS AT THE NATIONAL BUREAU OF STANDARDS

John R. Beall, Research Associate

The Lists of Certified Dental Materials have been kept up to date despite the fact that other activities of the fellowship have had to be curtailed.

Since July 1, 1942, tests of two certified acrylic denture base materials have been completed. One was found to be satisfactory, the other failed to comply with the specification requirements. One dental mercury has been certified, tested and added to the list.

Manufacturers of several other products have indicated interest in certifying their products. Some have filed the necessary information and samples for test are being procured.

A survey of the certified inlay casting gold alloys, started during the past year, is nearing completion. The delay in completing this survey is ascribable to the failure of some manufacturers to submit the necessary samples when requested. It appears that the pressure of supplying war materials is the cause of the manufacturers' delay. However, all but eight type C alloys, one type B and two type A alloys have been tested.

Certain physical properties of some wrought gold alloy wires, lent by the manufacturers, have been determined, to check statements made regarding the proposed revision of the specification for gold wire. An attempt to develop an improved corrosion test for noble metal alloys was interrupted when Mr. H. J. Caul was lent by the A. D. A. Research Commission to the National Bureau of Standards for work on an emergency war project of indefinite duration.

The amount of wear on acrylic resin teeth in two experimental dentures was measured and a report of the results of the tests on the dentures was prepared and submitted to THE JOURNAL. Some work has been done with the object of minimizing, if possible, certain undesirable properties of resins as used for teeth, inlays, etc. Results, to date, are negative.

The problems of substitute materials have occupied a large part of the cooperative research of the Bureau Staff and the A.D.A. Fellowship. A substitute for tinfoil in the fabrication of dentures has been developed and announced to the profession in THE JOURNAL and elsewhere. An announcement of a substitute for hydrocolloidal impression materials will be released as soon as the approval of the Department of Justice is secured.

The foregoing are illustrative of the types of problems at present predominant in dental research. The importance of prompt and satisfactory answers is self-evident in view of the shortage of many currently used materials.

The first printing of the summary of the work done in the dental laboratory at the National Bureau of Standards, prepared by Souder and Paffenberger, under the title of "Physical Properties of Dental Materials, Circular C-433 of the National Bureau of Standards," has been sold out, this fact necessitating reprinting and indicating that the profession has found the book useful. Schools or dentists wishing copies of this publication in the near future should secure them from this edition as a third printing is not anticipated during the emergency.

Active interest in the work of the Fellowship continues as shown by the correspondence received, the requests for reprints of publications from the laboratory and visitors, of whom twenty-two complied with the necessarily increased restrictions at the Bureau to bring their questions for discussion.

FELLOWSHIP IN DENTAL DISEASES AT THE NATIONAL INSTITUTE OF HEALTH

Edward G. Hampp,
Assistant Dental Surgeon
Research Associate

The oral bacteria constitute one group of the most interesting bacterial flora of the body, yet little is known concerning the cultural characteristics, classification

and role in oral and systemic disease. Of the bacteria comprising this group, the spirochetes have presented the most difficulty from a technical standpoint in isolation and maintenance in artificial media.

The constant association of *Borrelia vincenti* and the smaller oral treponemes with fusiform bacilli in cases of ulceromembranous stomatitis (trench mouth, Vincent's infection) has aroused considerable interest in the possible relationship of these organisms to the disease. Under present world conditions, this infection may possibly become of major importance. Articles in the British literature and sporadic reports in the United States indicate an increasing prevalence of this condition, particularly in the armed forces and among industrial workers.

Borrelia vincenti has apparently never been obtained in pure culture. However, popular opinion incriminates the organism as the principal etiologic agent in the infection because of its constant presence in overwhelming numbers in such conditions in association with fusiform bacilli and the smaller treponemes.

In order to determine the role played by *Borrelia vincenti* in ulcerative stomatitis, it is imperative that this organism and its symbions be obtained in pure culture so that animal experiments may be attempted to ascertain their relationship, if any, to the disease. Up to the present time, it is doubtful whether the Vincent spirochete has ever been isolated. The smaller oral treponemes have been obtained in pure culture on few occasions, and their cultivation has been found to be an exceedingly difficult task, particularly their isolation from the highly contaminated primary cultures.

The past six months have been devoted entirely to the study of culture media and technics in an attempt to isolate *Borrelia vincenti*. On one occasion, a loosely coiled spirochete, morphologically similar to the Vincent organism, was carried over for a period of twenty-four hours in a mixed culture. With this exception, the results have been uniformly negative. Considerable advance, however, has been made in the development of a modified technic for rapid routine isolation and mass cultivation of the small oral treponemes. This technic has been applied successfully in the isolation of the small oral treponemes from human cases of Vincent's infection and black tongue in dogs. The results of these experiments will in the near future be submitted for publication.

MISCELLANEOUS

The sale of the book "Dental Caries" is progressing slowly, and the Board members are requested to urge their colleagues to purchase copies of the book for their libraries.

The Commission is still seeking a competent research worker to devote his efforts to dental caries research at the National Institute of Health. Because of the war, it is very difficult to find the right man, but the Commission intends to continue its search and hopes to have a favorable report at our next annual meeting.

Plans are in preparation for organizing a committee to study the clinical aspects of Vincent's disease. The work of this committee will be intimately associated with the research work now being carried on by our Dr. Hampp at the National Institute of Health. It is felt that the tying in of the clinical picture of Vincent's disease with the laboratory research will be of immense value to the profession.

Respectfully submitted,
M. D. HUFF, *Chairman*,
DANIEL F. LYNCH, *Secretary*,
1678 Primrose Road, N.W.
Washington, D. C.

DIRECTORY OF STATE SOCIETY OFFICERS AND DATES OF MEETINGS, 1942-1943

ALABAMA DENTAL ASSOCIATION

J. Sharp Gillespy, President.....Frank Nelson Bldg., Birmingham
Herbert H. Bryans, President Elect.....Comer Bldg., Birmingham
Pryor A. Williams, Secretary-Treasurer.....1005 Protective Life Bldg., Birmingham
Next annual meeting: Birmingham, April 13-14, 1943.

ARIZONA STATE DENTAL SOCIETY

John Henry, President.....Valley Bank Bldg., Tucson
Taylor T. Hicks, President Elect.....Prescott
Blair A. Glennie, Secretary-Treasurer.....Box 1911, Tucson
Next annual meeting: Phoenix, in May.

ARKANSAS STATE DENTAL ASSOCIATION

J. H. Flanagin, President.....Conway
I. M. Sternberg, Secretary-Treasurer.....Merchants Bank Bldg., Fort Smith
Next annual meeting:

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

Francis J. Conley, President.....1052 W. 6th St., Los Angeles
Albert V. Vieille, President Elect.....727 W. 7th St., Los Angeles
Robert L. Borland, Secretary.....602 Chapman Bldg., Los Angeles
Harry H. Bleecker, Treasurer.....5410 Wilshire Blvd., Los Angeles
Next annual meeting: Ambassador Hotel, Los Angeles, September 13-15, 1943.

CALIFORNIA STATE DENTAL ASSOCIATION

William V. Ryder, Jr., President.....2000 Van Ness Ave., San Francisco
George W. Hahn, President Elect.....2300 Durant Ave., Berkeley
Lloyd E. Linehan, Secretary.....450 Sutter St., San Francisco
John W. Hagan, Treasurer.....1505 Webster St., Alameda
Next annual meeting: Fairmont Hotel, San Francisco, April 12-14, 1943.

COLORADO STATE DENTAL ASSOCIATION

Ralph L. Christy, President.....820 Majestic Bldg., Denver
W. W. Cogswell, Sr., President Elect.....16 Berthe Circle, Colorado Springs
C. K. Phillips, Secretary.....529 Majestic Bldg., Denver
Charles H. Watson, Treasurer.....500 Metropolitan Bldg., Denver
Next annual meeting: Cosmopolitan Hotel, Denver, June 17-19, 1943.

CONNECTICUT STATE DENTAL ASSOCIATION

Bernard H. Allen, President.....647 Main St., Hartford
Hugh Gibb, Jr., President Elect.....107 Whitney Ave., New Haven
Earle S. Arnold, Secretary-Treasurer.....37 Linnard Road, West Hartford
Next annual meeting: Hartford, May 5-7, 1943.

DELAWARE STATE DENTAL SOCIETY

William Henry Powell, President.....214 S. Bancroft Parkway, Wilmington
John A. Casey, President Elect.....Medical Arts Bldg., Wilmington
Charles F. Pierce, Secretary.....611 Delaware Ave., Wilmington
Henry S. Keaveny, Treasurer.....922 Jefferson St., Wilmington
Next annual meeting:

DISTRICT OF COLUMBIA DENTAL SOCIETY

George B. Clendenin, President.....7349 Wisconsin Ave., Bethesda, Md.
W. T. Birthright, President Elect.....1835 Eye St., N. W., Washington
J. Walter Bernhard, Secretary-Treasurer.....1835 Eye St., N. W., Washington
Next annual meeting: Washington, June 8, 1943.

FLORIDA STATE DENTAL SOCIETY

A. M. Smith, Jr., President.....416 Tampa St., Tampa
E. C. Lunsford, President Elect.....2742 Biscayne Blvd., Miami
H. L. Cartee, Secretary-Treasurer.....810 Huntington Bldg., Miami
Next annual meeting:

GEORGIA DENTAL ASSOCIATION

R. E. L. Pattilo, President.....Moultrie
J. H. Stegall, President Elect.....Lindale
R. H. Murphy, Secretary.....605 Bankers Ins. Bldg., Macon
Frank Tillery, Treasurer.....Columbus
Next annual meeting: Ansley Hotel, Atlanta, May 17-19, 1943.

HAWAII TERRITORIAL DENTAL SOCIETY

Roy Stisher, President.....Box 156, Kahului, Maui, T. H.
H. L. Houvener, President Elect.....Pantheon Building, Honolulu
John H. Dawe, Secretary...Box 39, Honolulu
F. S. Kagihara, Treasurer.....1476 S. King St., Honolulu
Next annual meeting:

IDAHO STATE DENTAL ASSOCIATION

R. A. Sutcliff, President.....Twin Falls
Vaughn D. Lyons, President Elect...Pocatello
Fred A. Kallusky, Secretary.....Buhl
L. E. Shaw, Treasurer.....Pocatello
Next annual meeting: Twin Falls, June 1943.

ILLINOIS STATE DENTAL SOCIETY

Neil D. Vedder, President.....Carrollton
F. J. Hurlstone, President Elect.....30 N. Michigan Ave., Chicago
L. H. Jacob, Secretary.....634 Jefferson Bldg., Peoria
R. W. McNulty, Treasurer.....1757 W. Harrison St., Chicago
Next annual meeting: Peoria, May 10-14, 1943.

INDIANA STATE DENTAL ASSOCIATION

Fred W. Leavell, President.....Station Hospital, Camp Croft, S. C.
Roy D. Smiley, President Elect...301 Peoples Bank and Trust Building, Washington
E. E. Ewbank, Secretary.....Kingman
William Bogie, Treasurer.....525 American Nat'l Bank Bldg., Vincennes
Next annual meeting: Claypool Hotel, Indianapolis, May 17-19, 1943.

IOWA STATE DENTAL SOCIETY

L. M. FitzGerald, President.....718 Roshek Bldg., Dubuque
L. C. Hemsworth, President Elect.....Black Bldg., Waterloo
C. S. Foster, Secretary.....803 Dows Bldg., Cedar Rapids
L. C. Dow, Treasurer.....Marion
Next annual meeting: Hotel Fort Des Moines, Des Moines, May 3-5, 1943.

KANSAS STATE DENTAL ASSOCIATION

Arthur J. Buff, President.....Mills Bldg., Topeka
R. E. Olson, President Elect.....Union Nat'l Bank Bldg., Wichita
Fred A. Richmond, Secretary.....Huron Bldg., Kansas City
Stanley H. Flickinger, Treasurer....Baldwin
Next annual meeting: Kansas City, Mo., May 11-13, 1943.

KENTUCKY STATE DENTAL ASSOCIATION

Wallace B. Standard, President.....Francis Bldg., Louisville
Frank B. Hower, President Elect.....Heyburn Bldg., Louisville
J. L. Walker, Secretary-Treasurer.....640 Barbee Way South, Louisville
Next annual meeting: Brown Hotel, Louisville, April 5-7, 1943.

LOUISIANA STATE DENTAL SOCIETY

Larry J. Dupuy, President.....217 Camp St., New Orleans
Walter L. Comeaux, President Elect.....Louisiana Nat'l Bank Bldg., Baton Rouge
Julian S. Bernhard, Secretary.....407 Medical Arts Bldg., Shreveport
Oscar J. Ory, Sr., Treasurer.....Garyville
Next annual meeting: Roosevelt Hotel, April 8-10, 1943.

MAINE DENTAL SOCIETY

Paul R. Smith,.....145 Lisbon St., Lewiston
Raymond A. Derbyshire, President Elect..Skowhegan
George S. Nevens, Secretary.....Box 63, Damariscotta Mills
Edward W. Peaslee, Treasurer.....184 Water St., Augusta
Next annual meeting:

MARYLAND STATE DENTAL ASSOCIATION

Arthur I. Bell, President.....Medical Arts Bldg., Baltimore
Myron S. Aisenberg, President Elect.....3619 Rosedale Road, Baltimore
Paul A. Deems, Secretary.....835 Park Ave., Baltimore
John M. Hyson, Treasurer.....Medical Arts Bldg., Baltimore
Next annual meeting: Baltimore, May 3-4, 1943.

MASSACHUSETTS DENTAL SOCIETY

Frederick E. Grant, President.....603 High St., Dedham
Harold J. Cronin, President Elect.....739 Liberty St., Springfield
Philip E. Adams, Secretary.....106 Marlborough St., Boston
Glenn W. Lawrence, Treasurer.....412 Beacon St., Boston
Next annual meeting: Hotel Statler, Boston, May 17-20, 1943.

MICHIGAN STATE DENTAL SOCIETY

L. E. Hooper, President.....
Nat'l Bank of Wyandotte Bldg., Wyandotte
O. C. Applegate, President Elect.....
.....216 S. State St., Ann Arbor
William R. Davis, Secretary.....
.....Michigan Dept. of Health, Lansing
H. C. Gerber, Executive Secretary.....
.....1514 Olds Tower Bldg., Lansing
E. J. Chamberlin, Treasurer.....
.....520 Ashton Bldg., Grand Rapids
Next annual meeting: Hotel Statler, Detroit, April 19-21, 1943.

MINNESOTA STATE DENTAL ASSOCIATION

Clayton A. Swanson, President.....
.....1009 Nicollet Ave., Minneapolis
W. Lester Webb, President Elect....Fairmont
L. M. Cruttenden, Secretary.....
.....498 Lowry Bldg., St. Paul
A. R. Schmid, Treasurer.....Worthington
Next annual meeting:

MISSISSIPPI DENTAL ASSOCIATION

George P. Evans, President.....
.....Standard Life Bldg., Jackson
T. Ford Leggett, President Elect.....Laurel
O. L. Colee, Secretary-Treasurer...Magnolia
Next annual meeting: Jackson, April 12-13, 1943.

MISSOURI STATE DENTAL ASSOCIATION

Walter C. Shull, President.....
.....63rd & Brookside, Kansas City
D. H. Phelps, President Elect.....
.....Box 243, Nevada
C. W. Digges, Secretary-Treasurer.....
.....Exchange Nat'l Bank Bldg., Columbia
Next annual meeting: Kansas City, Muehlebach Hotel, May 11-13, 1943.

MONTANA STATE DENTAL ASSOCIATION

H. S. Degnan, President.....Forsyth
Joseph A. Herzog, President Elect.....Butte
T. T. Rider, Secretary-Treasurer.....
.....9 Higgins Block, Missoula
Next annual meeting: Helena, May 6-8, 1943.

NEBRASKA STATE DENTAL ASSOCIATION

F. A. Pierson, President.....
.....Federal Securities Bldg., Lincoln
J. G. Colgan, President Elect.....McCook
C. A. Bumstead, Secretary.....
.....Stuart Bldg., Lincoln
R. G. Drake, Treasurer.....
.....First Nat'l Bank Bldg., Omaha
Next annual meeting: Fontenella Hotel, Omaha, May 10-12, 1943.

NEVADA STATE DENTAL ASSOCIATION

O. M. Seifert, President.....
.....Medico Dental Bldg., Reno
Stephen W. Comish, President Elect.....
.....Henderson Bank Bldg., Elko
Louis M. Nelson, Secretary-Treasurer.....
.....Box 2029, Reno
Next annual meeting: Reno, in June 1943.

NEW HAMPSHIRE DENTAL SOCIETY

Leon H. Jacobs, President.....
.....105 Water St., Exeter
Edward C. Godfrey, President Elect.....
.....90 Washington St., Dover
R. C. Frost, 2nd Vice President.....
.....814 Elm St., Manchester
F. E. Williams, Secretary.....
.....814 Elm St., Manchester
William A. Young, Treasurer.....
.....40 N. Main St., Concord
Next annual meeting: Boston, Mass.

NEW JERSEY STATE DENTAL SOCIETY

James L. Hanley, President.....
.....586 Central Ave., East Orange
S. F. Reese, President Elect.....
....Weymouth & Atlantic Aves., Ventnor
Eugene W. Newman, Vice President.....
.....16 Wallace St., Red Bank
F. K. Heazelton, Secretary.....
.....223 E. Hanover St., Trenton
Charles P. Crowe, Treasurer.....
.....521 Main St., East Orange
Next annual meeting: Newark Athletic Club, Newark, May 4-5, 1943.

NEW MEXICO STATE DENTAL SOCIETY

S. B. Bonney, President.....Carlsbad
D. R. Biddle, President Elect....Albuquerque
J. A. Eilar, Secretary-Treasurer.....
.....First Nat'l Bank Bldg., Albuquerque
Next annual meeting: Carlsbad, in June 1943.

THE DENTAL SOCIETY OF THE STATE OF NEW YORK

James T. Ivory, President.....
..612 Security Mutual Bldg., Binghamton
Leon L. Abbey, President Elect.....
.....619 Union St., Schenectady
Charles A. Wilkie, Secretary.....
.....1 Hanson Place, Brooklyn

George D. Greenwood, Treasurer.....Mercantile Bldg., Rochester
Next annual meeting: Hotel Syracuse, Syracuse, May 18-21, 1943.

NORTH CAROLINA DENTAL SOCIETY

Paul Fitzgerald, President.....Greenville
C. E. Minges, President Elect.....Peoples Bank Bldg.,Rocky Mount
E. M. Medlin, Secretary-Treasurer..Aberdeen
Next annual meeting: O'Henry Hotel, Greensboro, May 3-5, 1943.

NORTH DAKOTA STATE DENTAL ASSOCIATION

W. C. Follett, President.....Devils Lake
W. E. Cole, President Elect.....Bismarck
W. D. Toepke, Secretary.....New Salem
J. A. Chestnut, Treasurer.....Leeds
Next annual meeting cancelled.

OHIO STATE DENTAL SOCIETY

Thomas J. McDermott, President.....821 Rose Bldg., Cleveland
Clyde H. Hebble, President Elect.....327 E. State St., Columbus
Edward C. Mills, Secretary.....255 E. Broad St., Columbus
Earl G. Jones, Treasurer.....185 E. State St., Columbus
Next annual meeting: Cleveland, November 7-10, 1943.

OKLAHOMA STATE DENTAL SOCIETY

George E. Roland, President.....Medical Arts Bldg., Oklahoma City
G. A. Roelke, President Elect.....Medical Arts Bldg., Tulsa
Eugene W. Wise, Secretary.....Medical Arts Bldg., Tulsa
W. C. Travis, Treasurer.....Chickasha
Next annual meeting: Skirvin Hotel, Oklahoma City, April 11-14, 1943.

OREGON STATE DENTAL ASSOCIATION

N. L. Zimmerman, President.....Medical-Dental Bldg., Portland
J. C. Bartels, President Elect.....Selling Bldg., Portland
F. W. Hollister, Secretary-Treasurer.....Selling Bldg., Portland
Next annual meeting: Portland, June 10-12, 1943.

PANAMA CANAL ZONE DENTAL SOCIETY

G. J. Gabriel, President.....Gorgas Hospital, Ancon, Canal Zone
A. DeCastro, Vice President....Panama City
Harry W. Mitten, Jr., Secretary-Treasurer.....Box 13, Balboa, Canal Zone
Next annual meeting:

PENNSYLVANIA STATE DENTAL SOCIETY

Fred C. Robinson, President.....Fayette T. & T. Bldg., Uniontown
Leroy M. Ennis, President Elect.....4001 Spruce St., Philadelphia
Edward R. Aston, Secretary.....421 Market St., Kingston
C. J. Hollister, Executive Secretary.....217 State St., Harrisburg
Wayde D. Kelly, Treasurer.....Payne-Shoemaker Bldg., Harrisburg
Next annual meeting: William Penn Hotel, Pittsburgh, May 4-6, 1943.

PHILIPPINE ISLANDS DENTAL SOCIETY

Joaquin Ladao, President.....208 Kneedler Bldg., Manila
Gil Montinela, Vice President.....Manila
Faustino F. Turla, Secretary-Treasurer....777 Legarda St., Manila
Next annual meeting:

COLLEGE OF DENTAL SURGEONS OF PUERTO RICO

Jose Vicente, President.....Apartado 1448, San Juan
Luis Munoz Santaella, Vice President.....Rio Piedras
Juan Font Suarez, Secretary.....Apartado 1448, San Juan
J. Hermandez Gonzales, Treasurer.....Apartado 1448, San Juan
Next annual meeting:

RHODE ISLAND STATE DENTAL SOCIETY

Maurice A. Denby, President.....7 Washington St., Warren
Arthur M. Dring, President Elect.....266 Thames St., Newport
Charles F. McKivergan, Secretary-Treasurer.....102 Waterman St., Providence
Next annual meeting: Providence, January 1944.

SOUTH CAROLINA STATE DENTAL ASSOCIATION

F. K. Rabb, President.....Charleston
L. E. Dellinger, President Elect....Greenville
P. B. Hair, Secretary-Treasurer..Spartanburg
Next annual meeting: Columbia, May 1943.

SOUTH DAKOTA STATE DENTAL SOCIETY

T. E. Johnson, President.....Rapid City
A. A. Wollman, President Elect.....Huron
Ernest W. Elmen, Secretary.....Sioux Falls
W. H. Morgans, Treasurer.....Aberdeen
Next annual meeting: Huron, May 9-11, 1943.

TENNESSEE STATE DENTAL ASSOCIATION

Roy O. Elam, President.....
.....Medical Arts Bldg., Nashville
C. N. Williams, President Elect.....
.....Exchange Bldg., Memphis
E. J. Justis, Secretary-Treasurer.....
.....Exchange Bldg., Memphis
Next annual meeting: Andrew Jackson Hotel, Nashville, May 10-13, 1943.

TEXAS STATE DENTAL SOCIETY

Walter T. Newton, President.....
.....Esperson Bldg., Houston
Stuart E. Hays, President Elect.....
.....Medical Arts Bldg., San Antonio
Willard Ogle, Secretary-Treasurer.....
.....Medical Arts Bldg., Dallas
Next annual meeting: Fort Worth, April 19-22, 1943.

UTAH STATE DENTAL ASSOCIATION

D. L. Folsom, President.....
....First Nat'l Bank Bldg., Salt Lake City
D. A. Jones, President Elect.....
....First Nat'l Bank Bldg., Salt Lake City
C. G. Green, Secretary-Treasurer.....
.....1001 Boston Bldg., Salt Lake City
Next annual meeting: Salt Lake City, June 3-5, 1943.

VERMONT STATE DENTAL SOCIETY

Charles W. Houghton, President.....
.....Bellows Falls
Norman F. Johnson, 1st Vice President....
.....Rutland
Byron W. Bailey, 2nd Vice President.....
.....Bradford
J. Gillam Irons, Secretary.....Bennington
Howard F. Killary, Treasurer.....Burlington
Next annual meeting: Burlington, May 19-20, 1943.

VIRGINIA STATE DENTAL ASSOCIATION

G. M. Goad, President.....Hillsville
Paul Burbank, President Elect.....Hampton
J. E. John, Secretary-Treasurer.....
.....804 Medical Arts Bldg., Roanoke
Next annual meeting: Hotel Roanoke, Roanoke, April 19-21, 1943.

WASHINGTON STATE DENTAL ASSOCIATION

C. W. Johnson, President.....
.....436 Medical Arts Bldg., Tacoma
L. L. Foote, President Elect.....
.....1233 Medical & Dental Bldg., Seattle
A. W. Jeffery, Secretary-Treasurer.....
.....533 Medical & Dental Bldg., Seattle
Next annual meeting:

WEST VIRGINIA STATE DENTAL SOCIETY

S. M. Callaway, President.....Huntington
C. M. Musser, President Elect.....Fairmont
M. H. Nicholson, Secretary.....Bluefield
John S. Stone, Treasurer.....Clarksburg
Next annual meeting: Parkersburg, May 17-19, 1943.

WISCONSIN STATE DENTAL SOCIETY

F. J. Martin, President.....Medford
J. P. Justin, President Elect.....
.....2225 W. Capitol Drive, Milwaukee
Kenneth F. Crane, Executive Secretary....
.....1233 Bankers Bldg., Milwaukee
C. P. Collins, Treasurer.....
.....625 57th St., Kenosha
Next annual meeting: Schroeder Hotel, Milwaukee, March 22-24, 1943.

WYOMING STATE DENTAL ASSOCIATION

W. J. Ryan, President.....Cheyenne
J. E. Beal, President Elect.....Casper
J. D. McNiff, Secretary-Treasurer...Laramie
Next annual meeting: Casper, June 1943.

CLEVELAND'S THIRD ANNUAL CHILDREN'S DENTAL HEALTH DAY

THE Third Annual Children's Dental Health Day of the Cleveland Dental Society, February 1, proved so successful that steps are under way to make observance of this day national instead of local.

The presence of Dr. J. Ben Robinson, President of the American Dental Association; Dr. Lon W. Morrey, director of the Bureau of Public Relations; Dr. Emory W. Morris, chairman of the Council on Dental Health, and other national dental figures supplied the nucleus

Cartoon by J. H. Donahey, Cleveland Plain Dealer.

around which this spirited and enthusiastic event revolved. More than 625 dentists from a dozen states attended the meeting and a real contribution was made to children's dentistry.

The cooperation of the press and the radio was a feature of the day. These two agencies caught the spirit of the occasion and, all the way from cub reporter to editor, gave their utmost support from spot announcement to that of Lowell Thomas, who climaxed radio's participation by devoting a part of his February broadcast to Children's Dental Health Day.

Cleveland realizes, as does the nation, that the only successful approach to the caries problem is through education.

NEWS ITEMS

WAR EMERGENCY

As a result of the desire and effort on the part of the Government to conserve the resources of the country in every manner and in every field, and in the endeavor to forestall a threatened shortage of paper, the Government has asked THE JOURNAL to curtail its publication product to ninety per cent of the amount of material published in 1942.

We are more than agreeable to this request and gladly accept the curtailment in the spirit of helpfulness to the war effort.

This curtailment, however, will place definite restrictions on the amount of material published during the present year, but we are sure that all those affected will be glad to participate in this gesture of patriotism at this critical moment.

AMERICAN ASSOCIATION OF ORTHODONTISTS PRIZE ESSAY CONTEST POSTPONED

THE Research Committee of the American Association of Orthodontists announces the postponement of the Prize Essay Contest, until the next meeting is called by the Association.

In order that those contestants who have already submitted manuscripts may not be discriminated against through this action, and also to make their studies available to the rest of the profession, their manuscripts are being returned to them with full authority for publication, wherever they may care to place them. A list of such manuscripts is being held in the office of the chairman, and the manuscripts or reprints thereof will be called for at the time of the judging.

The deadline for submission of manuscripts has been postponed indefinitely and new manuscripts may be submitted for consideration at any time until further notice. All manuscripts will be judged at the same time.

ALLAN G. BRODIE, *Chairman,*
Research Committee,
30 N. Michigan Ave.,
Chicago, Ill.

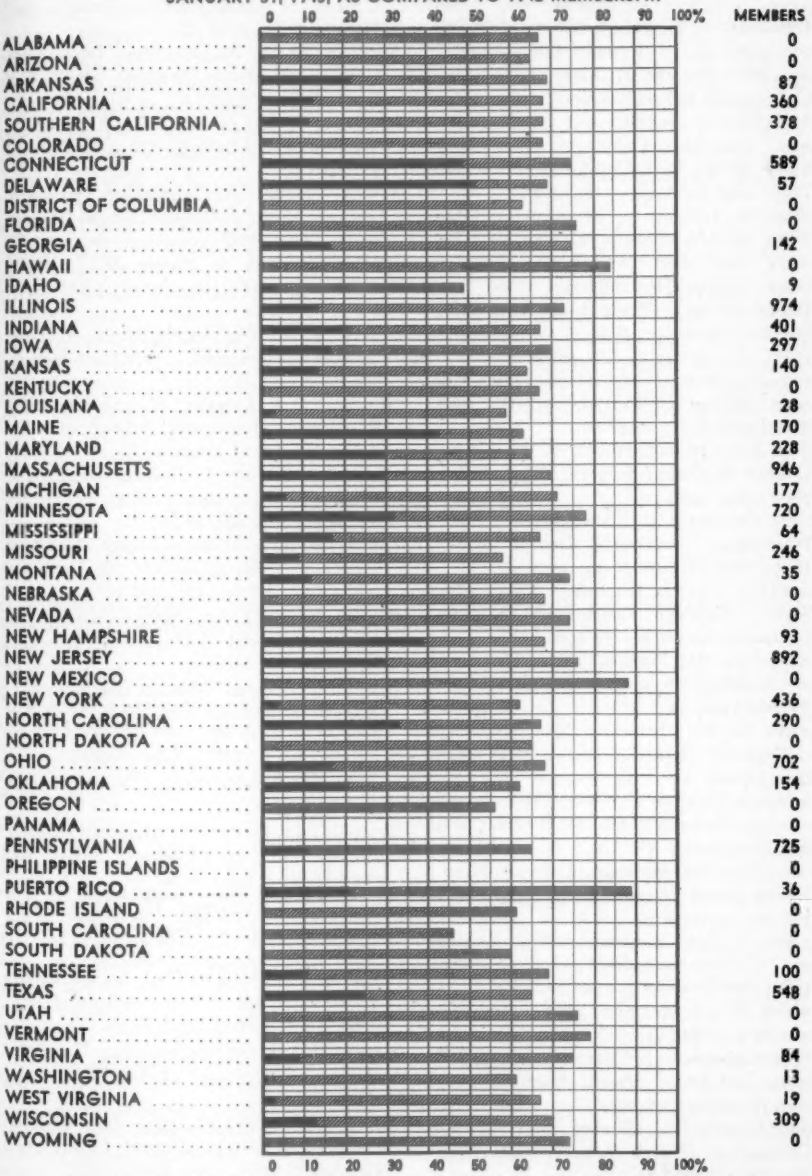
FIVE STATE POST GRADUATE CLINIC CANCELLED

IT is with regret that the Five State Post Graduate Clinic Committee announces the cancellation of the meeting scheduled for March. However, there is pride in this statement. We are doing factions in hastening peace, when again our part in cooperating with all other we can resume the many happy contacts we cherish with pleasant memory.

MARCUS N. PARKS, *Chairman,*
Publicity Committee,
1789 Columbia Road, N.W.,
Washington, D. C.

Membership Page

PERCENTAGE OF DUES RECEIVED IN CENTRAL OFFICE AS OF JANUARY 31, 1943, AS COMPARED TO 1942 MEMBERSHIP



Percentage based on dental population figures supplied by the State Society Secretaries.

1943 percenage — 1942 percentage

DEATHS

ALLISON, EVERETT G., Steubenville, Ohio; University of Pittsburgh School of Dentistry, 1925; died November 30; aged 39.

BARRINGTON, ELMORE F., Lima, Ohio; Ohio College of Dental Surgery, 1897; died September 5; aged 65.

BARRY, FREDERICK CARY (1st Lt.), Newburgh, N. Y.; Tufts College Dental School, 1933; died January 15; aged 35.

BIDENHORN, GEORGE F., Miamisburg, Ohio; Ohio State University College of Dentistry, 1911; died November 16; aged 59.

BROOKS, ROBERT JOHN (Major, U. S. Army Dental Corps); Wauwatosa, Wis.; Marquette University School of Dentistry, 1917; died January 16; aged 51.

BRUNDAGE, STEPHEN W., Chicago, Ill.; Chicago College of Dental Surgery, 1898; died December 9; aged 65.

BRYAN, EVAN HENRY, Huron, S. D.; Chicago College of Dental Surgery, 1891; died in November; aged 70.

CHASE, FREDERICK B., Sierra Madre, Calif.; Washington University Dental School, 1890; died December 23; aged 87.

CORZELIUS, LEO G., Columbus, Ohio; Ohio State University College of Dentistry, 1901; died December 6; aged 63.

DODDS, NEAL D., Pittsburgh, Pa.; University of Pittsburgh, School of Dentistry, 1925; died October 30.

GEENTY, G. W., Ortonville, Minn.; Chicago College of Dental Surgery, 1898; died December 4.

GREENHAW, BARNEY F., Peoria, Ill.; Northwestern University Dental School, 1889; died October 5.

HEAD, CHARLES HOLDEN, Helena, Mont.; United States Dental College, 1891; died January 22; aged 80.

HOLMES, E. LEE, Sandersville, Ga.; University of Tennessee College of Dentistry, 1889; died October 7; aged 72.

HOLMES, F. C., Mangum, Okla.; died September 27; aged 74.

HOWE, GEORGE R., Muscatine, Iowa; Chicago College of Dental Surgery, 1905; died November 21; aged 62.

KALK, GEORGE P., Chicago, Ill.; Chicago College of Dental Surgery, 1901; died January 19; aged 65.

KUMLER, ALBERT A., Cincinnati, Ohio; Ohio College of Dental Surgery, 1891; died December 21; aged 76.

MCLEAN, FRANK B., Columbus, Ohio; Ohio College of Dental Surgery, 1898; died December 24; aged 72.

MANSELL, R. J., Cordell, Okla.; Kansas City, Western Dental College, 1900; died August 13; aged 67.

MARCK, ADDISON A., Burlington, Wis.; Milwaukee Medical College Dental Department, 1902; died November 26; aged 63.

MORRISON, MARY A., Salem, N. J.; Philadelphia Dental College, 1897; died October 2.

MEYER, R. G., Blue Earth, Minn.; St. Louis College of Dentistry, 1917; died November 17.

NORTHCUTT, J. EMMETT, Kansas City, Mo.; Washington University School of Dentistry, 1904; died January 5.

OSTERBERG, ALFRED J., Duluth, Minn.; University of Minnesota College of Dentistry, 1901; died August 30.

PADEN, SEYMOUR DAVIS, Chicago, Ill.; University of Illinois College of Dentistry, 1903; died October 28; aged 75.

PALMER, FAYE, Chelsea, Mich.; University of Michigan School of Dentistry, 1906; died December 14; aged 67.

PASSMORE, EDWARD NORTON, Dothan, Ala.; Atlanta Dental College, 1899; died December 15; aged 72.

PEXA, FRANK J., Montgomery, Minn.; Marquette University Dental School, 1922; died December 19.

RUEGESEGGER, DANIEL U., Akron, Ohio; Ohio College of Dental Surgery, 1892; died December 29; aged 76.

RUNCIE, G. T., Chicago, Ill.; Indiana University School of Dentistry, 1910; died October 30.

SCHWINN, F. WILLIAM, Red Lodge, Mont.; State University of Iowa College of Dentistry, 1906; died September 26.

SEIFERT, O. H., Springfield, Ill.; University of Louisville School of Dentistry, 1904; died recently.

SIGEL, S. ALBERT, Chicago, Ill.; Chicago College of Dental Surgery, 1914; died October 7.

SMITH, GUY L., Kansas City, Kan.; Kansas

City-Western Dental College, 1919; died May 13; aged 52.

SPICKERMAN, A. C., DeKalb, Ill.; Chicago College of Dental Surgery, 1914; died December 26.

STALKER, WILLIAM COFFIN, Lewiston, Idaho; died August 14; aged 78.

STUART, DALE KAY, Stuart, Nebr.; University of Nebraska College of Dentistry, 1916; died October 22; aged 48.

TINKHAM, HARRY SHELTON, Fort Wayne, Ind.; Central College of Dentistry, 1901; died January 14; aged 69.

ULVESTAD, OLIVER M., Chicago, Ill.; Northwestern University Dental School, 1902; died November 30.

WALKER, MORRIS KENNERLY, Atlanta, Ga.; Atlanta-Southern Dental College, 1923; died September 28; aged 47.

WARREN, HENRY D., Warren, Ohio; University of Buffalo, School of Dentistry, 1896; died December 3; aged 68.

WARWICK, WALTER A., Tulsa, Okla.; University of Tennessee, College of Dentistry, 1908; died December 3; aged 56.

WEIGHT, FRANK J., Tulsa, Okla.; St. Louis University School of Dentistry, 1918; died November 5; aged 47.

WHIFFEN, JOHN R., Janesville, Wis.; Chicago College of Dental Surgery, 1900; died November 10; aged 65.

WHITE, ALBERT R., Ashley, Ohio; Ohio Medical University, College of Dentistry, 1906; died June 2; aged 56.

WILSON, S. D., Purcell, Okla.; Western Dental College, 1908; died August 14; aged 73.

YOUNG, JOHN H., Milwaukee, Wis.; Marquette University School of Dentistry, 1917; died September 2; aged 51.

ZINCKE, LOUIS D., Cleveland, Ohio; University of Michigan School of Dentistry, 1898; died December 11; aged 66.

CURRENT LITERATURE

Availability of Calcium Ingested in the Process of Chewing Betel Leaves with Lime

By K. P. BASU AND OTHERS

METABOLIC studies of human beings in India have shown that the average dietary is extremely deficient in calcium. This may be attributed to a low per capita consumption of milk, only 7 ounces a day as compared with 35 ounces a day in many other countries. It has been estimated that 10 ounces of cow's milk per capita a day would be necessary to overcome calcium deficiency in India. Since the poverty of the average Indian prevents his obtaining such a supplement to his diet, a cheap substitute for milk was sought. It was thought that chewing betel leaves and nuts, a habit among the rural population, may provide calcium. Experiments confirming this viewpoint indicate that the calcium obtained by chewing six betel leaves is equivalent to that derived from 10 ounces of milk.—*Ind. J. M. Res.*, 30: 309, April 1942. E. GUNNAR JOHANSSON.

An Opportunity for Preventive Dental Medicine

By EDWARD F. FISCHER

AN investigation of the causes, effects, epidemiology and treatment of oral diseases with emphasis on Vincent's infection was conducted at Camp Shelby, Mississippi. Various oral lesions were correlated with the camp areas in which they were found for the purpose of inaugurating disease-preventive measures. Efforts were made to reduce Vincent's infection by early diagnosis. Diet and hygiene appeared to be vital considerations in its etiology. Cases were isolated, although there was no evidence that the infection was contagious or communicable. Chemotherapy alone did not cure. Necessary also were the eradication of parodontal crevices and pericoronal flaps, correction of traumatic occlusion and the establishment of health habits. The disease often recurred when incomplete treatment was given. Periodontia, it is concluded, should be regarded not as a specialty, but as an

integral part of general practice.—*Mil. Surg.*, 92:17, January 1943.

FRED A. DRUSE.

Wounds of Warfare

By F. A. COLLER and J. M. FARRIS

WORLD War I led to clinical and laboratory investigation of the causes, effects and treatments of wounds and wound infections. War wounds are not unlike those received in civilian life, but care and treatment are effected usually under less favorable conditions. The infection introduced into a wound at the time of infliction is generally less severe than that introduced by improper care or hospital technic. The necessity for complete and correct débridement is emphasized. Closure may be undertaken only on consideration of the age of the wound, the degree of contamination and the facilities at hand. Cotton and steel wire sutures may be used advantageously. Skin should be used in treating denuded surfaces to avoid scarring. Sulfonamides are recommended as adjuncts to early operative procedure. Precautions are essential to provide proper nutrition and fluid intake to overcome shock, hemorrhage, dehydration, starvation and hypoproteinemia.—*J. Lab. & Clin. Med.*, 28: 441, January 1943.

FRED A. DRUSE.

Report of a Case of Oral Myiasis

By ROBERT B. SHIRA

MYIASIS is a disease characterized by invasion of the tissues by flies or maggots. The case reported is the first in the literature in which maggots were found in the oral mucosa. The patient had been on maneuvers in the Panamanian jungles for two months, during which time he had slept in the open and neglected oral hygiene. The disease manifested itself in an acute localized inflammation of the labial mucosa over the upper central incisors, which was loosened from the underlying bone and perforated by a sinus-like opening in which six white larvae of *Cochliomyia macellaria* were found. The inflammation subsided immediately after removal of the worms.—*Mil. Surg.*, 92:57, January 1943.

FRED A. DRUSE.

Cysts of the Floor of the Mouth

By W. K. JOHNSTON

THE cysts usually found in the floor of the mouth are dermoid, epidermoid, ranular, thyroglossal, mucous and branchial. The dermoid cyst differs from the epidermoid only in content. The former is lined with stratified squamous epithelium and contains hair, skin, skin appendages and lipoid material. The latter is lined with mucous epithelium, sometimes ciliated, but contains no skin or epithelial appendages. There are two types of ranula, a slowly growing form and an acute type arising from sudden occlusion of the duct of one of the submaxillary or sublingual salivary glands. Ranular cysts are usually unilateral, but may occur bilaterally. Thyroglossal and branchial cysts may involve the floor of the mouth only by encroachment, due to excessive growth. The treatment in all cases of cyst in the floor of the mouth is surgical removal.—*Ann. Otol. Rhin. & Laryng.*, 51:917, December 1942.

E. GUNNAR JOHANSSON.

Malignant Epithelial Tumor of Mandible in Child Aged Nine

By M. S. AISENBERG

A CASE is reported of a 9-year-old boy with a swelling of the lower jaw of six weeks' duration. An intra-oral roentgenogram revealed a carious and infected first molar. This and the second deciduous molar in the same quadrant were removed. No attention was directed to the unusual space (half inch) between the first permanent molar and the second deciduous molar. After extraction, the swelling increased, but showed no signs of suppuration. The sockets filled in with normal pink tissue. Since the swelling was continuously expanding, it was immediately suspected of being a malignant growth. The diagnosis was confirmed by biopsy.—*Am. J. Orthodontics*, 28:736, December 1942.

PETER P. DALE.

Hemangio-Endothelioma: A Discussion of Differential Criteria with a Report of Three Oral Cases

By V. D. CHEYNE and H. E. SILBERSTEIN

MICROSCOPIC examination of questionable neoplastic growth is always necessary for

diagnosis. According to the interpretation placed on the histogenesis of the endothelial cell, the endothelial tumor may be regarded as a structure of mesoblastic origin. The histogenetic classification of angiomatous tumors is less useful as an aid in identification than the morphologic because it is difficult to demonstrate the origin of endothelial cells. The number and character of cells and spaces are important diagnostic criteria in the classification of blood tumors. Among others, the vacuolization of cells and the formation of abortive capillary spaces are distinguishing features of the hemangio-endothelioma. Clinically, the tumor is relatively benign, but it has malignant possibilities. Dense relatively avascular types are indicative of greater metastasizing ability. Trauma appears to play an important role in its growth, and repeated unsuccessful attempts at removal may invite metastatic lesions. The hemangio-endothelioma is amenable to surgery, but is difficult to remove because of its infiltrative manner of growth. Though the tumor is relatively avascular, danger from hemorrhage should not be taken lightly. Radium and roentgen therapy may be of benefit, but neither has been extensively used or given a satisfactory trial—*Am. J. Orthodontics*, 28:703, December 1942.

PETER P. DALE.

So-Called Mixed Tumors of the Salivary Glands

By WALTER H. SHELDON

STUDIES of fifty-four so-called mixed tumors of the salivary glands indicate that they include cancerous and non-cancerous elements composed of one or two types of cells normally found in the salivary glands: (1) those derived from the secretory epithelium and (2) basket cells derived from the myo-epithelium. Secretory epithelial neoplasms present a peculiar myxomatous and pseudocartilaginous appearance of the connective tissue stroma as a result of an excessive and probably abnormal secretion produced by these cells. Neoplasms arising from both types are true organoid tumors structurally resembling the salivary glands. They may contain squamous metaplastic epithelium, myxomatous and pseudocartilaginous stroma, cartilage and bone. A few growths arise from the basket cells alone. These may assume a structural resemblance to tumors of the sweat glands, mammary glands or lacrimal glands.—*Arch. Path.* 35:1, January 1943.

PETER P. DALE.

Hemisection of the Mandible for Recurrent Adamantinoma

By J. W. HOLLOWAY

Two cases of conservatively treated recurrent adamantinoma in which hemisection of the mandible effected a cure are reported. In one instance, a large tumor mass involving the left side had on three occasions been partially resected and curetted, with recurrence after each treatment. Resection of the left mandible *in toto* removed every sign of the lesion with the exception of cystic extensions in the temporal region discovered one and six years after the operation. Deformity was prevented by wiring the teeth of the right side for a period of five weeks. In another case, a recurrent adamantine cyst of twelve years' duration was removed by hemisection, without recurrence. Slight deviation from the normal symmetry of the face was evident in both cases, but the masticatory efficiency of the teeth of the remaining jaws was not seriously impaired, although prosthesis was not attempted.—*Ann. Surg.*, 116:277, August 1942.

FRED A. DRUSE.

Application of Methyl Methacrylate to the Tooth: Cured at Mouth Temperature

By G. B. SALISBURY

WITH a new mode of application, methyl methacrylate is packed directly into prepared cavities and cured at mouth temperature. Technical modifications are employed for occlusal, gingival and proximal cavities in bicuspids, molars and anterior teeth, and for application of the material to incisal angles.—*D. Digest*, 49:14, January 1943.

PETER P. DALE.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issues of THE JOURNAL.

CALENDAR OF MEETING

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY, New York, March 22.

CLEVELAND (OHIO) DENTAL SOCIETY SPRING CLINIC, May 10-12.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month, from October to June at the United States Public Health Service Auditorium, Washington.

THOMAS P. HINMAN MID-WINTER CLINIC, Atlanta, Ga., March 28-30.

MEDICODENTAL CONVENTION, Mexico City, Mexico, March 1-6.

NEW YORK SOCIETY FOR ORAL DIAGNOSIS, New York, March 17.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, March 8-9.

ONTARIO DENTAL ASSOCIATION, Toronto, Canada, May 17-19.

SOUTHWESTERN SOCIETY OF ORTHODONTISTS, Tulsa, Okla., March 23-25.

WOMEN'S DENTAL SOCIETY OF NEW YORK, New York, March 18.

STATE SOCIETIES

March

Wisconsin, at Milwaukee (22-24)

April

Alabama, at Birmingham (13-14)
California, at San Francisco (12-14)
Kentucky, at Louisville (5-7)
Louisiana, at New Orleans (8-10)
Michigan, at Detroit (19-21)
Mississippi, at Jackson (12-13)
Oklahoma, at Oklahoma City (11-14)
Texas, at Fort Worth (19-22)
Virginia, at Roanoke (19-21)

May

Arizona, at Phoenix
Connecticut, at Hartford (5-7)
Georgia, at Atlanta (17-19)
Illinois, at Peoria (10-14)
Indiana, at Indianapolis (17-19)
Iowa, at Des Moines (3-5)
Kansas, at Kansas City, Mo. (11-13)
Maryland, at Baltimore (3-4)
Massachusetts, at Boston (17-20)
Missouri, at Kansas City (11-13)
Montana, at Helena (6-8)
Nebraska, at Omaha (10-12)
New Jersey, at Newark (4-5)
New York, at Syracuse (18-21)
North Carolina, at Greensboro (3-5)
Pennsylvania, at Pittsburgh (4-6)
South Carolina, at Columbia
South Dakota, at Huron (9-11)
Tennessee, at Nashville (10-13)
Vermont, at Burlington (19-20)
West Virginia, at Parkersburg (17-19)

June

Colorado, at Denver (17-19)
District of Columbia, at Washington (8)
Idaho, at Twin Falls
Nevada, at Reno
New Mexico, at Carlsbad
Oregon, at Portland (10-12)
Utah, at Salt Lake City (3-5)
Wyoming, at Casper

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, March 15. W. A. Wood, Merchants National Bank Bldg., Mobile, Secretary.

Arizona, at Phoenix, March 29. R. K. Trueblood, 25 N. Second St., Glendale, Secretary.

California, at San Francisco, April 19, and at Los Angeles, March 22. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Connecticut, at Hartford, March 24-29. Clarence G. Brooks, 302 State St., New London, Recorder.

Delaware, at Wilmington, April 6-9 (dentists); June 15-17 (dental hygienists).

Charles R. Jefferis, Medical Arts Bldg., Wilmington, Secretary.

Florida, at Jacksonville, March 15-18. H. B. Pattishall, 351 St. James Bldg., Jacksonville, Secretary.

Kentucky, at Louisville, March 9-12. W. F. Walz, 1114 First National Bank Bldg., Lexington, Acting Secretary.

Minnesota, at Minneapolis, March 15-20. G. R. Metcalf, Barnesville, Secretary.

New Jersey, June 28-July 2. J. Frank Burke, 150 E. State St., Trenton, Acting Secretary.

New Mexico, at Santa Fe., June 14-17. J. J. Clarke, Artesia, Secretary.

North Carolina, at Raleigh, April 5. Wilbert Jackson, Rich Building, Clinton, Secretary.

North Dakota, at Fargo, July 12-15. R. A. Andrews, Carrington, Secretary.

Ohio, at Columbus, March 1-3 (practical); March 22-24 (theoretical). Earl D. Lowry, 79 E. State St., Columbus, Secretary.

Pennsylvania, at Pittsburgh and Philadelphia, May 27-28 (dental hygienists). Reuben E. V. Miller, 61 N. Third St., Easton, Secretary.

South Carolina, at Columbia, March 25-27. T. C. Sparks, 1508 Washington St., Columbia, Secretary.

Tennessee, at Memphis, March 22-25. W. W. Martin, 115 W. Jefferson St., Pulaski, Secretary.

Texas, at Houston, March 23-26. Carl C. Hardin, Jr., 520 Littlefield Bldg., Austin, Secretary.

Vermont, at Montpelier, June 28-30. Charles I. Taggart, 139 Bank St., Burlington, Secretary.

Virginia, at Richmond, March 30. John M. Hughes, 715 Medical Arts Bldg., Richmond, Secretary.

West Virginia, at Charleston, June 28. R. H. Davis, 510 Goff Bldg., Clarksburg, Secretary.

Wisconsin, at Milwaukee, March 29-April 2. S. F. Donovan, Tomah, Secretary.

AMERICAN ASSOCIATION OF ORTHODONTISTS

THE annual meeting of the American Association of Orthodontists which was to have been held in Chicago, May 3-6, has been cancelled.

MAX E. ERNST, *Secretary*,
St. Paul, Minn.

AMERICAN BOARD OF ORTHODONTICS

THE American Board of Orthodontics announces the cancellation of its 1943 meeting previously scheduled to be held in conjunction with the American Association of Orthodontists meeting in May. Due notice will be given of the next meeting of the board.

B. G. DEVRIES, *Secretary*,
Medical Arts Bldg.,
Minneapolis, Minn.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

THE spring meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held March 22, with dinner at the Republican Club, 54 W. 40th St., New York, at 7 p. m. and the scientific session at 8:30, with the president, James R. Cameron, of Philadelphia, presiding. The scientific program will consist of a series of brief presentations of office experiences with anesthesia, by members: Elmer H. Brown, Trenton, N. J.; Lawrence Lee Mulcahy, Batavia, N. Y.; A. B. Rosoff, New Haven, Conn.; William J. McLaughlin, Bridgeport, Conn.; George H. Gendron, New Bedford, Mass., and James R. Cameron, Philadelphia, Pa. The members will discuss the presentations from the floor. Members of the profession are invited.

M. HILLEL FELDMAN, *Secretary*,
730 Fifth Avenue,
New York, N. Y.

CLEVELAND DENTAL SOCIETY SPRING CLINIC

THE annual spring clinic meeting of the Cleveland Dental Society will be held May 10-12 at the Statler Hotel.

ALBIUN F. SADD, *Chairman*,
Publicity Committee,
7904 Superior Ave.,
Cleveland.

THOMAS P. HINMAN MIDWINTER CLINIC

THE 1943 Thomas P. Hinman Mid-Winter Clinic will be held at the Baltimore Hotel, Atlanta, Ga., March 28-30.

THOMAS CONNER, *Chairman*,
604 Doctors Bldg.,
Atlanta, Ga.

MEDICODENTAL CONVENTION

THE IV Medicodental Convention, arranged by the Asociacion Mexicana de Ortodoncia, under the patronage of the president of the Mexican Republic, Gen. Manuel Avila Camacho, will be held in Mexico City, March 1-6, at the School of Dentistry, with the cooperation of a selected group of North American physicians, dentists, and orthodontists, headed by Spencer R. Atkinson.

GUILLERMO S. GAMBOA, *Secretary,*
Madero 34,
Mexico City, Mexico.

NEW YORK SOCIETY FOR ORAL DIAGNOSIS

THE next meeting of the New York Society for Oral Diagnosis will be held March 17 at 8:30 p.m., at Squibb Hall, 745 Fifth Ave., New York.

H. JUSTIN ROSS, *Secretary,*
515 Madison Ave.,
New York.

NEW YORK SOCIETY OF ORTHODONTISTS

THE spring meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, March 8-9.

NORMAN L. HILLYER, *Secretary,*
Professional Bldg.,
Hempstead.

ONTARIO DENTAL ASSOCIATION

THE Seventy-Sixth Annual Convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, May 17-19. Dentists from the United States and from all parts of Canada will be welcome.

EDMUND A. GRANT, *Secretary,*
86 Bloor St., West,
Toronto.

SOUTHWESTERN SOCIETY OF ORTHODONTISTS

THE annual meeting of the Southwestern Society of Orthodontists will be held at the Mayo Hotel, Tulsa, Okla., March 23-25.

R. E. OLSON, *Secretary,*
Union Nat'l Bank Bldg.,
Wichita, Kan.

WOMEN'S DENTAL SOCIETY OF NEW YORK

THE Women's Dental Society of New York will hold its spring meeting at the Pennsylvania Hotel, March 18, at 8 p.m. A dinner preceding the meeting will be held in the hotel cafe at 6:30. The subject of the evening's address will be announced later. The society officers for the coming year are: president, Hannah Appel; vice president, Sadie Goodman; secretary, Charlotte Brickner; treasurer, Rose Farb. Committee chairmen are: program, Olive R. Meyer; membership, Sarah Gray; reception, Flora Albano; publicity, Margaret Reiss.

MARGARET REISS, *Chairman of Publicity,*
102-50 187th St.,
Hollis, N. Y.

ALABAMA DENTAL ASSOCIATION

THE next annual meeting of the Alabama Dental Association will be held in Birmingham, April 13-14.

PRYOR A. WILLIAMS, *Secretary,*
1005 Protective Life Bldg.,
Birmingham

CALIFORNIA STATE DENTAL ASSOCIATION

THE next annual meeting of the California State Dental Association will be held in San Francisco, at the Fairmont Hotel, April 12-14.

LLOYD E. LINEHAN, *Secretary,*
450 Sutter St.,
San Francisco.

CONNECTICUT STATE DENTAL ASSOCIATION

THE next annual meeting of the Connecticut State Dental Association will be held in Hartford, May 5-7.

EARLE S. ARNOLD, *Secretary,*
37 Linnard Road,
West Hartford.

GEORGIA DENTAL ASSOCIATION

THE next annual meeting of the Georgia Dental Association will be held in Atlanta at the Ansley Hotel, May 17-19.

R. H. MURPHY, *Secretary,*
605 Bankers Insurance Bldg.,
Macon.

ILLINOIS STATE DENTAL SOCIETY

THE next annual meeting of the Illinois State Dental Society will be held in Peoria, May 10-14.

L. H. JACOB, *Secretary,*
634 Jefferson Bldg.,
Peoria.

INDIANA STATE DENTAL ASSOCIATION

THE next annual meeting of the Indiana State Dental Association will be held in Indianapolis, at the Claypool Hotel, May 17-19.

E. E. EWBANK, *Secretary*,
Kingman.

IOWA STATE DENTAL SOCIETY

THE next annual meeting of the Iowa State Dental Society will be held in Des Moines, at the Hotel Fort Des Moines, May 3-5.

C. S. FOSTER, *Secretary*,
803 Dows Bldg.,
Cedar Rapids.

KANSAS STATE DENTAL ASSOCIATION

THE next annual meeting of the Kansas State Dental Association will be held in Kansas City, Mo., May 11-13.

FRED A. RICHMOND, *Secretary*,
Huron Bldg.,
Kansas City, Kan.

KENTUCKY STATE DENTAL ASSOCIATION

THE next annual meeting of the Kentucky State Dental Association will be held April 5-7 at the Brown Hotel, Louisville.

J. L. WALKER, *Secretary*,
640 Barbee Way South,
Louisville.

LOUISIANA STATE DENTAL SOCIETY

THE next annual meeting of the Louisiana State Dental Society will be held in New Orleans, at the Roosevelt Hotel, April 8-10.

JULIAN S. BERNHARD, *Secretary*,
419 Medical Arts Bldg.,
Shreveport.

MARYLAND STATE DENTAL ASSOCIATION

THE annual meeting of the Maryland State Dental Association will be held in Baltimore, May 3-4.

PAUL A. DEEMS, *Secretary*,
Medical Arts Bldg.,
Baltimore.

MASSACHUSETTS DENTAL SOCIETY

THE next meeting of the Massachusetts Dental Society will be held in Boston, at the Hotel Statler, May 17-20.

PHILIP E. ADAMS, *Secretary*,
106 Marlborough St.,
Boston.

MICHIGAN STATE DENTAL SOCIETY

THE next annual meeting of the Michigan State Dental Society will be held in Detroit, at the Hotel Statler, April 19-21.

WILLIAM R. DAVIS, *Secretary*,
Michigan Dept. of Health,
Lansing.

MISSISSIPPI DENTAL ASSOCIATION

THE next annual meeting of the Mississippi Dental Association will be held in Jackson, April 12-13.

O. L. COLEE, *Secretary*,
Magnolia.

MISSOURI STATE DENTAL ASSOCIATION

THE next annual meeting of the Missouri State Dental Association will be held in Kansas City, May 11-13, in conjunction with the Kansas State Dental Association meeting.

C. W. DIGGS, *Secretary*,
Columbia.

MONTANA STATE DENTAL ASSOCIATION

THE next annual meeting of the Montana State Dental Association will be held in Helena, May 6-8.

T. T. RIDER, *Secretary*,
Missoula.

NEBRASKA STATE DENTAL ASSOCIATION

THE next annual meeting of the Nebraska State Dental Association will be held in Omaha, at the Fontenella Hotel, May 10-12.

C. A. BUMSTEAD, *Secretary*,
Stuart Bldg.,
Lincoln.

NEW JERSEY STATE DENTAL SOCIETY

THE next meeting of the New Jersey State Dental Society will be held in Newark, at the Newark Athletic Club, May 4-5.

F. K. HEAZELTON, *Secretary*,
223 East Hanover St.,
Trenton.

DENTAL SOCIETY OF THE STATE OF NEW YORK

THE next annual meeting of the Dental Society of the State of New York will be held in Syracuse, at the Hotel Syracuse, May 18-21.

CHARLES A. WILKIE, *Secretary,*
One Hanson Place,
Brooklyn.

NORTH CAROLINA DENTAL SOCIETY

THE next annual meeting of the North Carolina Dental Society will be held in Greensboro, at the O'Henry Hotel, May 3-5.

E. M. MEDLIN, *Secretary,*
Aberdeen.

OKLAHOMA STATE DENTAL SOCIETY

THE next annual meeting of the Oklahoma State Dental Society will be held in Oklahoma City, at the Skirvin Hotel, April 11-14.

EUGENE W. WISE, *Secretary,*
Medical Arts Bldg.,
Tulsa.

OREGON STATE DENTAL ASSOCIATION

THE next annual meeting of the Oregon State Dental Association will be held in Portland, June 10-12.

F. W. HOLLISTER, *Secretary,*
Selling Bldg.,
Portland.

PENNSYLVANIA STATE DENTAL SOCIETY

THE next annual meeting of the Pennsylvania State Dental Society will be held in Pittsburgh, at the William Penn Hotel, May 4-6.

EDWARD R. ASTON, *Secretary,*
421 Market St.,
Kingston.

SOUTH DAKOTA STATE DENTAL SOCIETY

THE next annual meeting of the South Dakota State Dental Society will be held in Huron, May 9-11.

ERNEST W. ELMEN, *Secretary,*
Sioux Falls.

TENNESSEE STATE DENTAL ASSOCIATION

THE officers of the Tennessee State Dental Association will hold its annual meeting in Nashville, May 10-13, at Hotel Andrew Jackson.

E. JEFF JUSTIS, *Secretary,*
1504 Exchange Bldg.,
Memphis.

TEXAS STATE DENTAL SOCIETY

THE next annual meeting of the Texas State Dental Society will be held in Fort Worth, April 19-22.

WILLARD OGLE, *Secretary,*
Medical Arts Bldg.,
Dallas.

UTAH STATE DENTAL ASSOCIATION

THE next annual meeting of the Utah State Dental Association will be held in Salt Lake City, June 3-5.

C. G. GREEN, *Secretary,*
1001 Boston Bldg.,
Salt Lake City.

VERMONT STATE DENTAL SOCIETY

THE next annual meeting of the Vermont State Dental Society will be held in Burlington, May 19-20.

J. GILLAM IRONS, *Secretary,*
Bennington.

VIRGINIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Virginia State Dental Association will be held at the Hotel Roanoke, Roanoke, April 19-21.

J. E. JOHN, *Secretary,*
Medical Arts Bldg.,
Roanoke.

WEST VIRGINIA STATE DENTAL SOCIETY

THE next annual meeting of the West Virginia State Dental Society will be held in Parkersburg, May 17-19.

M. H. NICHOLSON, *Secretary,*
Bluefield.

WISCONSIN STATE DENTAL SOCIETY

THE annual meeting of the Wisconsin State Dental Society will be held at the Schroeder Hotel, Milwaukee, March 22-24.

KENNETH F. CRANE, *Executive Secretary,*
1233 Bankers Bldg.,
Milwaukee.

BOARD OF DENTAL EXAMINERS OF ALABAMA

THE Board of Dental Examiners of Ala-

bama will conduct its next annual dental examination beginning March 15, in Birmingham. All credentials must be filed with the secretary at least two weeks in advance of the examination. Address all correspondence to

W. A. WOOD, *Secretary,*
Merchants National Bank Bldg.,
Mobile.

ARIZONA STATE DENTAL BOARD

THE next examination to be conducted by the Arizona State Dental Board for a license to practice dentistry in Arizona will be held in Phoenix commencing March 29. All credentials must be in the office of the secretary March 15. This will be the only examination conducted by the state board in 1943. Address all communications to

R. K. TRUEBLOOD, *Secretary,*
25 N. Second Ave.,
Glendale.

BOARD OF DENTAL EXAMINERS OF CALIFORNIA

THE next examinations to be conducted by the Board of Dental Examiners of California for a license to practice dentistry and for a license to practice dental hygiene in California will be held in Los Angeles, commencing on March 22, and in San Francisco commencing on April 19. All credentials must be in the office of the Secretary, Room 203, 515 Van Ness Avenue, San Francisco, at least twenty days prior to the date of the examinations. Address all communications to Kenneth I. Nesbitt, Secretary, Room 203, 515 Van Ness Ave., San Francisco.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford, March 24-29, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

CLARENCE G. BROOKS, *Recorder,*
302 State St.,
New London.

DELAWARE STATE BOARD OF DENTAL EXAMINERS

THE next examinations conducted by the Delaware State Board of Dental Examiners will be held April 6-9, for applicants for dental licenses, and June 15-17 for applicants for licenses as dental hygienists. All examinations will be held in Wilmington.

CHARLES R. JEFFERIS, *Secretary,*
Medical Arts Bldg.,
Wilmington.

FLORIDA STATE BORD OF DENTAL EXAMINERS

THE Florida State Board of Dental Examiners will hold its annual examination of applicants for license to practice dentistry and dental hygiene in Florida at Jacksonville in the Seminole Hotel, March 15-18. Applicants for a license to practice dentistry must file preliminary applications by January 14. Final applications for license to practice dentistry or dental hygiene must be complete by February 13. Address all communications to

H. B. PATTISHALL, *Secretary,*
351 St. James Bldg.,
Jacksonville.

KENTUCKY STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Kentucky State Board of Dental Examiners will be held March 9-12, at the University of Louisville Dental School, Louisville. Dentists who graduated prior to 1943 and who wish to stand examination before this board must file applications, complete with full information requested, at this office not later than January 9. Applications of 1943 graduates must be in the secretary's office by February 9. Dental hygienists who have completed a two-year course and who desire to stand examination before this board must file applications with the Board by February 9. Ample time should be allowed for securing all data required. For application forms and further information, apply to

W. F. WALZ, *Acting Secretary,*
1114 First National Bank Bldg.,
Lexington.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS

THE next examination to be conducted by the Minnesota State Board of Dental Examiners will be held at the College of Dentistry, University of Minnesota, Minneapolis, March 15-20. All examination fees must be

in the hands of the secretary at least ten days before the date of examination. Address all communications to

G. R. METCALF, *Secretary*,
Barnesville.

NEW JERSEY STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its next regular examinations commencing June 28 and continuing for five days. On application to the secretary, a copy of the requirements and rules, instruction sheet and preliminary application will be forwarded. Candidates must file the preliminary application blank, with the examination fee of $25, on or before March 15. Future schedules will be announced.

J. FRANK BURKE, *Acting Secretary*,
150 E. State St.,
Trenton.

NEW MEXICO BOARD OF DENTAL EXAMINERS

THE New Mexico Board of Dental Examiners will hold its next meeting June 14-17 in Santa Fe. For further information, address

J. J. CLARKE, *Secretary*,
Artesia.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the North Carolina State Board of Dental Examiners for the examination of applicants for licensure will be held at the state capitol, Raleigh, beginning April 5. Applications must be filed with the secretary thirty days before the examination. For application blanks and further information, address

WILBERT JACKSON, *Secretary*,
Rich Building,
Clinton.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE North Dakota State Board of Dental Examiners will hold its next examination in the Gardner Hotel, Fargo, July 12-15. For further information and applications, address

R. A. ANDREWS, *Secretary*,
Carrington.

OHIO STATE DENTAL BOARD

THE practical examination of the Ohio State Dental Board will be held at Ohio State University College of Dentistry, Columbus, March 1-3. The theory examination will be held in Columbus, March 22-24. All applications must be in the hands of the secretary at least ten days before the date of the examination. For further information, apply to

EARL D. LOWRY, *Secretary*,
79 E. State St.,
Columbus.

DENTAL COUNCIL AND EXAMINING BOARD OF THE COMMONWEALTH OF PENNSYLVANIA

THE dental Council and Examining Board of the Commonwealth of Pennsylvania will give an examination for license to practice dental hygiene in Philadelphia and Pittsburgh, May 27-28. For further information and application blanks, address the Department of Public Instruction, Bureau of Professional Licensing, Dental Division, Harrisburg.

REUBEN E. MILLER, *Secretary*,
61 N. Third St.,
Easton.

SOUTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE South Carolina State Board of Dental Examiners will hold its next meeting in Columbia, March 25-27. All applications must be filled out and returned to the secretary at least thirty days before the examination.

T. C. SPARKS, *Secretary*,
1508 Washington St.,
Columbia.

TENNESSEE BOARD OF DENTAL EXAMINERS

THE next examination for licensure of the Tennessee State Board of Dental Examiners will be held in Memphis at the College of Dentistry, University of Tennessee, March 22-25. All applications and fees must be in the hands of the secretary thirty days before the date of the examination. For applications and other information, address

W. W. MARTIN, *Secretary*,
115 W. Jefferson St.,
Pulaski.

TEXAS BOARD OF DENTAL EXAMINERS

THE Texas Board of Dental Examiners will hold its next examination March 23-26, in Houston. Graduates only will be examined. Applications must be filed at least ten days prior to the date of examination. For further information, address

CARL C. HARDIN, JR.,
Executive Secretary,
520 Littlefield Bldg.,
Austin.

VERMONT STATE BOARD OF DENTAL EXAMINERS

THE Vermont State Board of Dental Examiners will meet for the purpose of examining candidates in dentistry and dental hygiene, June 28-30, at the State House, Montpelier.

CHARLES I. TAGGART, *Secretary,*
139 Bank St.,
Burlington.

VIRGINIA STATE BOARD OF DENTAL EXAMINERS

THE next regular meeting of the Virginia State Board of Dental Examiners will be held at the Medical College of Virginia, Richmond, beginning at 9 a.m., March 30. Each applicant will be required to present a certificate from the Virginia State Board of Education, State Office Building, Richmond, showing that he has had at least one year of academic education equal to one year of college work. He must be a graduate of a Class A dental college and must be prepared to do any kind of practical or operative work necessary to the general practice of dentistry. The theoretical examination covers subjects usually found in a complete dental curriculum. No applications will be accepted after March 20. For application blanks and further information, apply to

JOHN M. HUGHES, *Secretary,*
715 Medical Arts Bldg.,
Richmond.

WEST VIRGINIA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the West Virginia State Board of Dental Examiners will be held in Charleston, commencing June 28. Applicants for license to practice dentistry or dental hygiene will be examined. Applications must be in the hands of the secretary ten days prior to the meeting. For application blanks and information, apply to

R. H. DAVIS, *Secretary,*
510-515 Goff Bldg.,
Clarksburg.

STATE OF WISCONSIN BOARD OF DENTAL EXAMINERS

A SPECIAL war emergency dental examination for licensure of dentists and hygienists will be held March 29-April 2 at the Marquette Dental School, Milwaukee. For applications and full information address

STEPHEN F. DONOVAN, *Secretary,*
Tomah.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS OF THE NAVY

THE next examination for appointment as assistant dental surgeon, U. S. Navy (lieutenant [junior grade], Dental Corps, U. S. Navy) will be held at the Naval Training Station, Norfolk, Va., the Naval Training Station, Great Lakes, Ill.; the Naval Training Station, San Diego, Calif., and the Naval Dental School, National Naval Medical Center, Bethesda, Md., May 3. Application for this examination should be made to the chief of the Bureau of Medicine and Surgery, Navy Department, Washington, D. C. Applicants for appointment as assistant dental surgeon must be citizens of the United States, more than 21, but less than 32 years of age at the time of acceptance of appointment, and graduates of a class A dental school. A circular of information listing physical and other requirements for appointment, subjects in which applicants are examined and other data pertaining to salary, allowances, etc., can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

DENTAL INTERNSHIPS

THERE will be two openings for dental internships available at the Gallinger Municipal Hospital, Washington, D. C., for the year beginning April 1. This is a 2,000 bed general hospital and the dental work is confined to minor and major oral and dental surgery for the inpatients of the hospital. For application forms, address Arthur Merril, Chief of Dental Division, Gallinger Municipal Hospital, Washington, D. C., giving a brief résumé of your scholastic record.

RESIDENCIES AND INTERNSHIPS

THERE will be available July 1 at the Sea View Hospital, New York, N. Y., two dental residencies and two dental internships, for a one year period. The Sea View Hospital, probably the largest tuberculosis hospital in the world, offers exceptional opportunities in most phases of dentistry. The dental residencies include a stipend of $1,200 annually plus maintenance; the internships, a stipend of $15 monthly plus maintenance. Application forms can be obtained from the medical superintendent, Sea View Hospital, Staten Island, New York.

RALPH HOWARD BRODSKY, *Director,*
Division of Oral Surgery.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation of the New York and the Eastman Dental Clinic, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Fellow in Dentistry and, according to his interest, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S., or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean,*
Rochester, N. Y.

NEW YORK UNIVERSITY COLLEGE OF DENTISTRY POSTGRADUATE COURSE

NEW YORK University College of Dentistry announces a postgraduate course in inhalation anesthesia, with special emphasis on nitrous oxide-oxygen anesthesia, conducted by E. A. Rovenstine, professor of anesthesia, N. Y. U. College of Medicine and Bellevue Hospital, and A. S. Mecca, assistant professor of oral surgery, N. Y. U. College of Dentistry and Bellevue Hospital. The course will be given on Friday mornings beginning April 30 and ending June 4. Classes will begin at 9 a.m. and continue to 12 noon. Direct all communications to the office of the dean, N. Y. U. College of Dentistry, 209 E. 23rd St., New York, N. Y. Tuition is $60, half of which should accompany a letter of endorsement from the applicant's dental society, the balance to be paid on the day of entrance to the course.

OHIO STATE UNIVERSITY POSTGRADUATE COURSE IN DENTISTRY

THE College of Dentistry of Ohio State University, at Columbus, offers postgraduate courses in dentistry that are especially designed for the general practitioner who may wish to amplify his training in any of the following fields: oral surgery, prosthodontia, x-ray, crown and bridge, periodontia, operative dentistry and root canal therapy. The length and dates of the courses are as follows:

X-ray	June 7 to 11
Oral surgery	June 14 to 18
Prosthodontia	June 14 to 19
Corwn and bridge	June 14 to 19
Operative dentistry	June 14 to 18
Root canal therapy	June 14 to 18
Periodontia	One day per week for ten weeks beginning June 23

The fees for these courses will be $50 a week, with the registration limited to ten men in each course, with the exception of prosthodontia, which will be $100 for the week's course, with registration limited to five.

It is the aim of these courses to teach new technics as well as to review the fundamentals. Further information and application blanks can be secured from the office of the dean, College of Dentistry, Ohio State University, Columbus.